ENGINEERING • INSTALLATION • MAINTENANCE

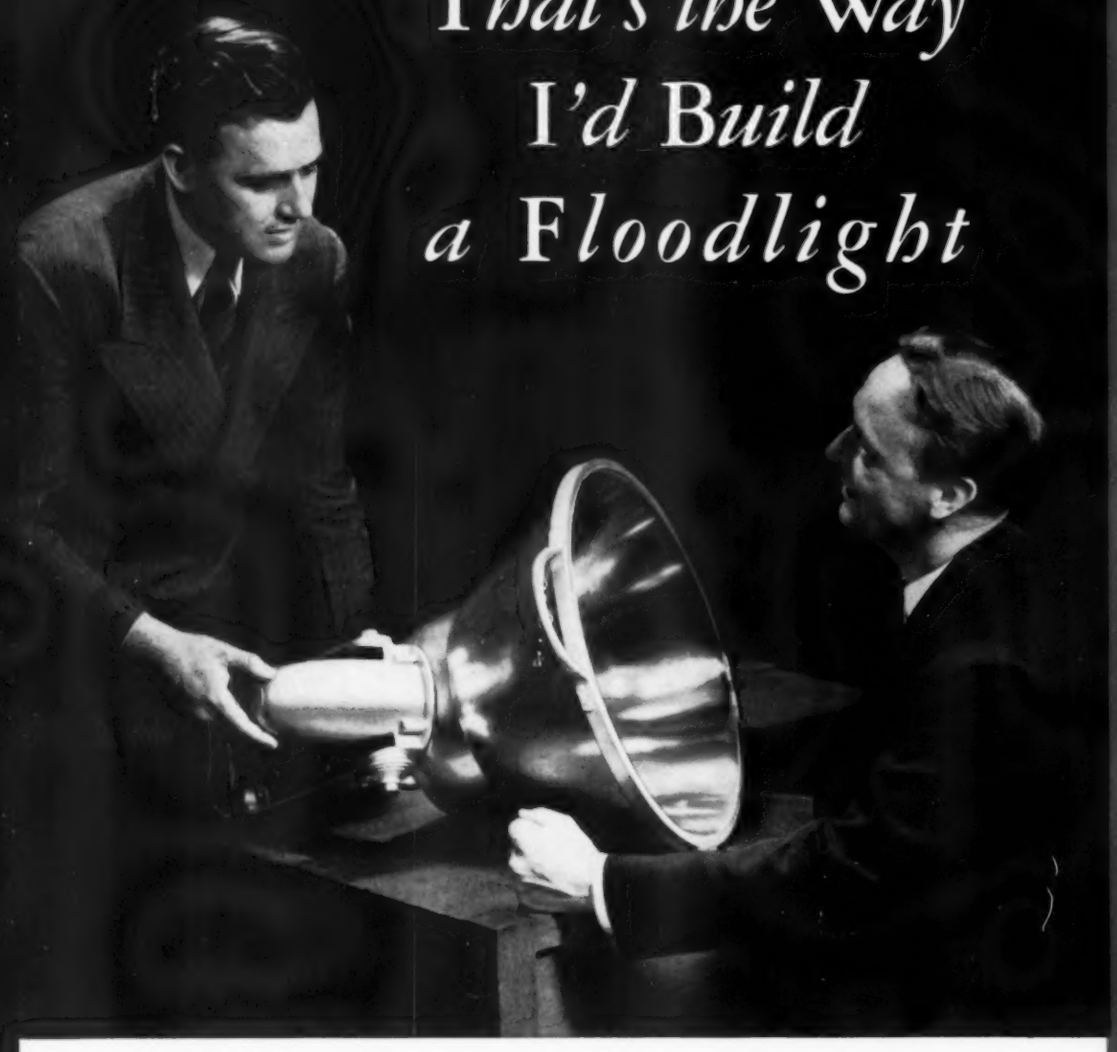
electrical contracting

Industrial Electrification SECTION

PAGES 49-64

MARCH • 1941

That's the Way I'd Build a Floodlight



Rear section of reflector is extruded to provide a flat metal-to-metal joint between socket housing and reflector. Keyhole slots provide quick removal of the reflector for either replacement or winter storage.

The one-piece socket housing will allow water to enter and drip out of lamp. Constructed of die-cast aluminum, does not require periodic painting to prevent rust.

Two-conductor cable enters the socket housing through a watertight rubber bushing. Strain on binding screws and wearing of cable insulation are eliminated.

Resetting ring makes relamping and servicing simple. The special reposition stop assures that the light returns to the proper position.

Continuous 180-degree slot in the crossarm bracket assures that all holes will be drilled alike. Holding and positioning bolt on different levels simplifies installation.

G-E Floodlights Are Built from the Buyer's Viewpoint

IF THE man who buys floodlights could draw up a set of specifications to best fulfill his requirements, you would find that General Electric floodlights meet those specifications completely.

For example, only in the G-E Type L-68 floodlight can you obtain the three features that make servicing easier—a 240-degree tip-over to raise the floodlight to servicing position, a repositioning stop for returning the unit quickly to the lighting position, and a slide-type door glass for easy removal and less breakage. These features have proved their worth on many installations—yet they cost you nothing extra.

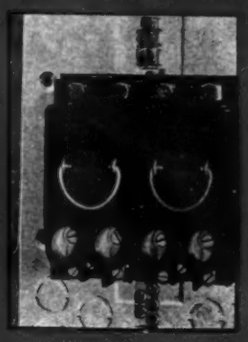
Recommend G-E *Alzak aluminum floodlights on your next job—you'll find them easier to sell because, in addition to the trim appearance and high efficiency, these floodlights have many other extra-value features. You'll find installation easier, too—and profits larger. For complete floodlighting equipment or recommendations call the nearest G-E Office. General Electric, Schenectady, N. Y.

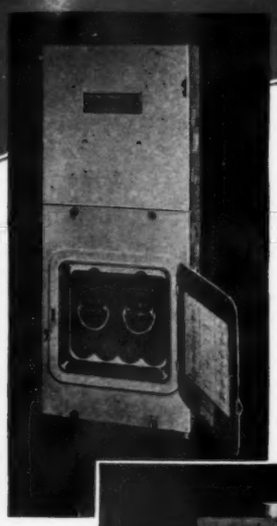
**Manufactured under Aluminum Company of America Patents*

GENERAL ELECTRIC

451-13

"What switch," say you? These "PULL-OUTS", say contractors!





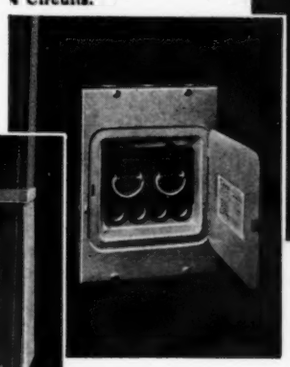
Cat. No. 258P
Metering equipment — Main and Range Switches.

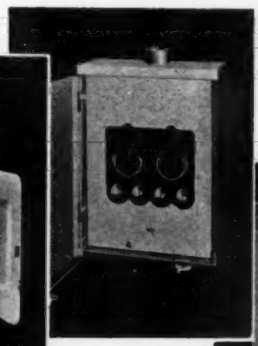
Cat. No. 74-6
60 amp. Main and Range Switches with 6 Circuits.

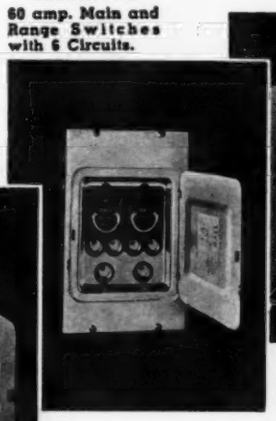
Cat. No. 32-4
60 amp. Outdoor Main and Range Switches with 4 Circuits.

Cat. No. 74-4
Interior — Solderless Connectors in View.

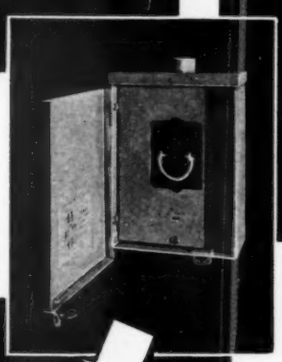
Cat No. 74-4
60 amp. Main and Range Switch, with 4 Circuits.

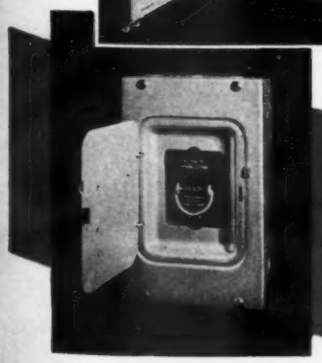






Cat. No. 81
Outdoor — Service Switch — 60 amp.





Cat. No. 72
Main or Range Switch — 60 amp.

125-250 V., 3 Poles, 2 Blades, 2 Cart. Fuses. S. N.

Compact, look swell, solderless connectors, knuckle room aplenty, ample knockouts, as easy to install as hanging a picture.

Murray SWITCHES

Get all the facts NOW!

METROPOLITAN DEVICE CORPORATION,
1250 Atlantic Ave.,
Brooklyn, N. Y.

Please send, free of charge, Murray Switch Catalog.

Name_____

Company_____

Address_____

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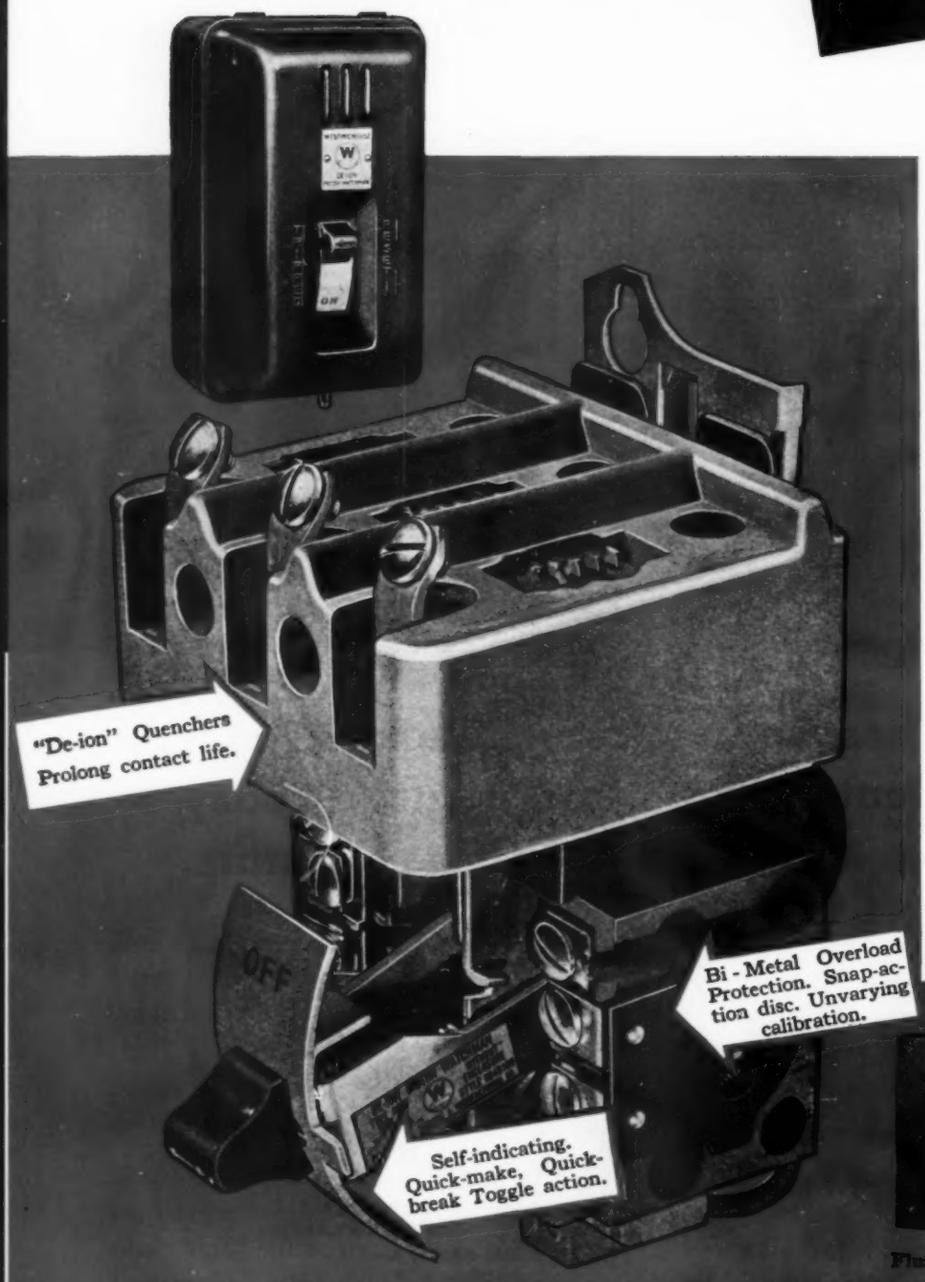
IT'S EASY TO see "ON" "TRIPPED" "OFF"


"De-ion" Quenchers Prolong contact life.
Bi-Metal Overload Protection. Snap-action disc. Unvarying calibration.
Self-indicating. Quick-make, Quick-break Toggle action.
OFF

WITH THE WESTINGHOUSE MOTOR WATCHMAN MANUAL MOTOR STARTER

FOR MOTORS UP TO 7½ HP
CLASS 10-100

Easy To Install

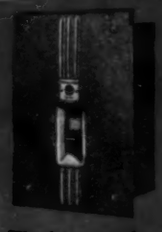
Compact design but with ample wiring space. Concentric knock-outs on top, bottom and sides make installation easy. Top screw holes in back of cabinet are keyhole-shaped. Bottom holes oblong for quick lining up. Straight-through wiring — line to top — load at bottom.

Lower Maintenance

"De-ion" quenchers prolong contact life. Bi-metal provides unvarying accurate overload protection. Trip-free switch — cannot be held closed against overload. Quick-make, quick-break prevents "teasing". All metal parts tinned or cadmium-plated. Silver-to-silver, double-break contacts. Deep-drawn cover and contact inspection window on arc quencher make maintenance easy.

WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

J-21137


Flush mounting

Watertight

Explosion-

Westinghouse

FOR PRODUCTION INSURANCE

buy Westinghouse

TIME SAVERS FOR INDUSTRY

WESTINGHOUSE COMBINATION LINESTARTER

For Motor Control and Circuit Protection

CLASS 11-206

Magnetic motor starter—motor-circuit switch—motor overload protection—nofuze circuit protection—all in one unit. Bi-metal gives permanently accurate overload protection. "De-ion" quenchers protect contacts—save maintenance. Four-in-one Unit saves installation time—saves space—saves wiring—provides greater protection for operators.

WESTINGHOUSE SAFETY SWITCH

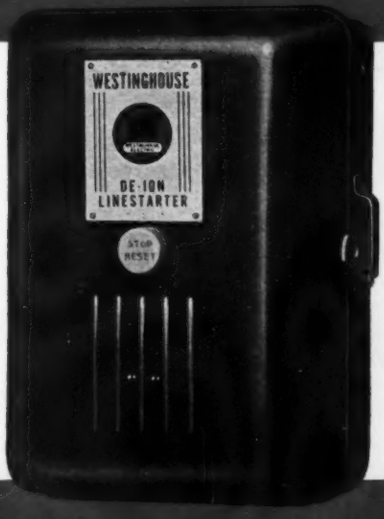
For Circuit Protection

Diamond-pointed break jaw and extended-blade construction prevent burning and beading of contacts. One-piece copper construction saves money by preventing power loss. Quick-make, quick-break on Types A and C. Ample space for wiring. Solderless lugs. "De-ion" arc quenchers on 575-V switches.

WESTINGHOUSE AB-I BREAKER

For Circuit Protection

Eliminates switch and fuses. Bi-metal overload protection. "De-ion" protection for contacts. Saves maintenance time and production time—circuit outages can be restored by operator. No live parts exposed. Door opens only when switch is in "Off" position. Occupies approximately 40% less space than switch and fuses.



WESTINGHOUSE "DE-ION" LINESTARTER

Magnetic Across-the-line Starter

CLASS 11-200

Push-button operated—built-in or mounted separately. Small, compact construction saves space. Bi-metal overload protection — hand or automatic reset. "De-ion" protection for contacts reduces maintenance. Vertical magnet operation speeds contact opening and prevents accidental operation.

Call your nearest Westinghouse Sales Office or Distributor

Motors and Control

75 Certified★ WIDEN

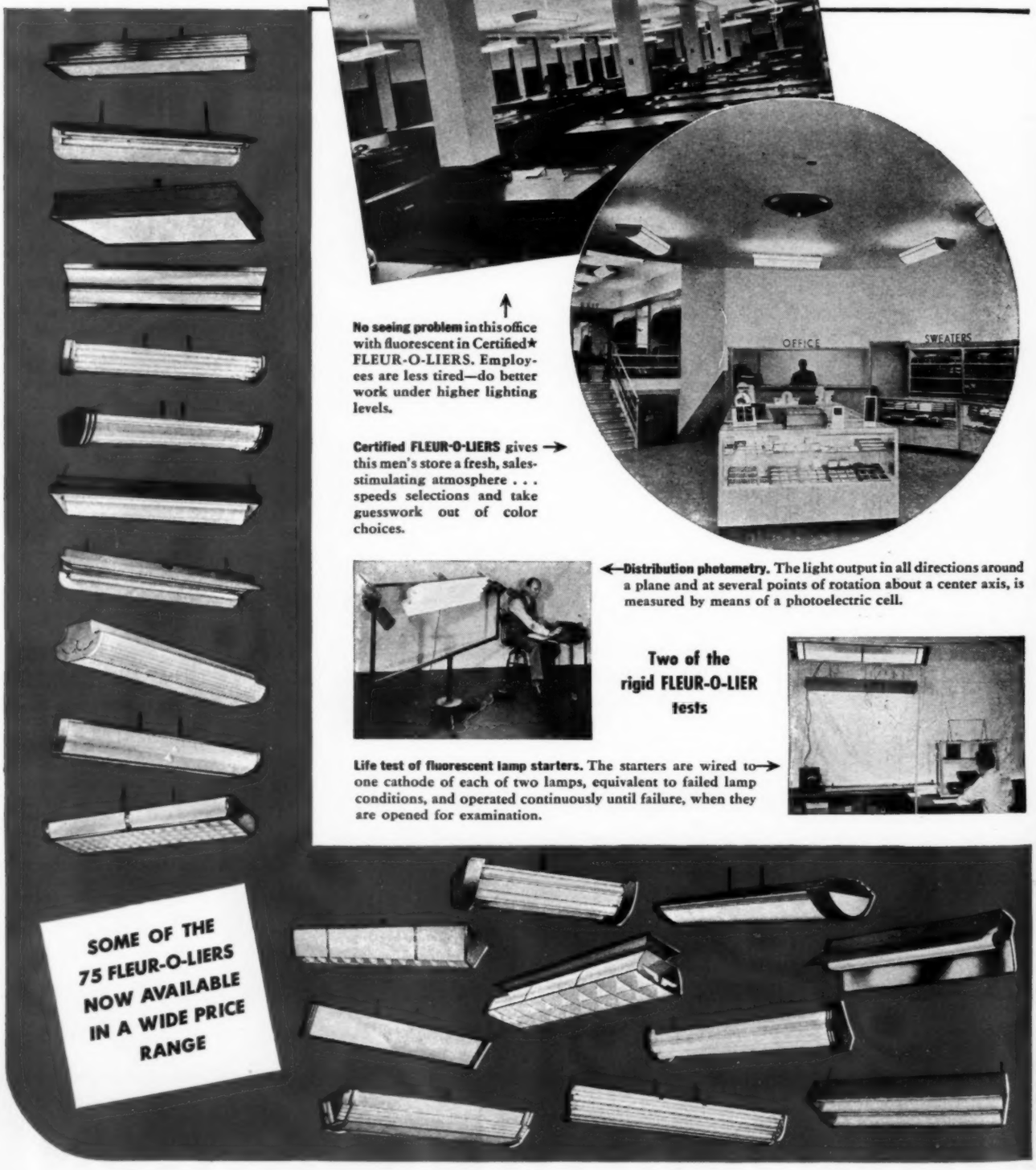
No seeing problem in this office with fluorescent in Certified★ FLEUR-O-LIERS. Employees are less tired—do better work under higher lighting levels.

Certified FLEUR-O-LIERS gives this men's store a fresh, sales-stimulating atmosphere . . . speeds selections and take guesswork out of color choices.

←Distribution photometry. The light output in all directions around a plane and at several points of rotation about a center axis, is measured by means of a photoelectric cell.

Two of the rigid FLEUR-O-LIER tests

Life test of fluorescent lamp starters. The starters are wired to one cathode of each of two lamps, equivalent to failed lamp conditions, and operated continuously until failure, when they are opened for examination.



SOME OF THE 75 FLEUR-O-LIERS NOW AVAILABLE IN A WIDE PRICE RANGE

FLEUR-O-LIERS

YOUR MARKET—*help you sell faster*

No limit to the choice—no limit to the interest. Everybody talks FLEUR-O-LIER when they talk fluorescent lighting.

You can satisfy every customer—fill any need for fluorescent fixtures with your choice of these 75 Certified★ FLEUR-O-LIERS. And you know that whichever FLEUR-O-LIER you select is built to 50 rigid specifications. These requirements couldn't be tougher or half as inclusive if your most expert customer wrote them himself!

Electrical Testing Laboratories *certify* that FLEUR-O-LIERS have met these 50 specifications set up by MAZDA lamp manufacturers for electrical, mechanical and lighting excellence. Control equipment (ballasts and starters) are *certified,* also, assuring the user of balanced, coordinated performance.

FLEUR-O-LIER means customer satisfaction not only in choice but in service—and that's what makes profitable jobs for any contractor!

Over 40 leading fixture manufacturers are now participating in the FLEUR-O-LIER program. Use the coupon below to get booklets and complete information.

All FLEUR-O-LIERS are eligible for FHA financing

FLEUR·O·LIER *Manufacturers*

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

★
FLEUR-O-LIER
The Manufacturer guarantees by affixing this label that this Fluorescent Luminaire is a duplicate of samples found by periodic examination to comply with the minimum requirements as set up in the
"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
which are sponsored by the Manufacturers of Mazda Lamps.
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.
A Copy of This Certificate Should
ETL
Appear upon Each Unit or Package
THIS CERTIFICATION IS CONTINGENT UPON EMPLOYMENT OF CERTIFIED AUXILIARIES OF OVER 85% POWER FACTOR

Let this label go to work for you!

1 It assures high quality fixtures and satisfactory performance for your customers.

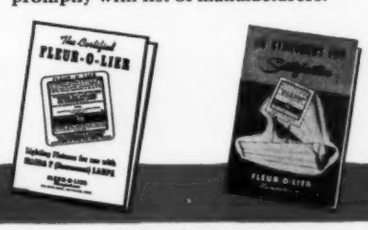
2 It means fixtures *certified* by Electrical Testing Laboratories to specifications set up by the MAZDA lamp manufacturers.

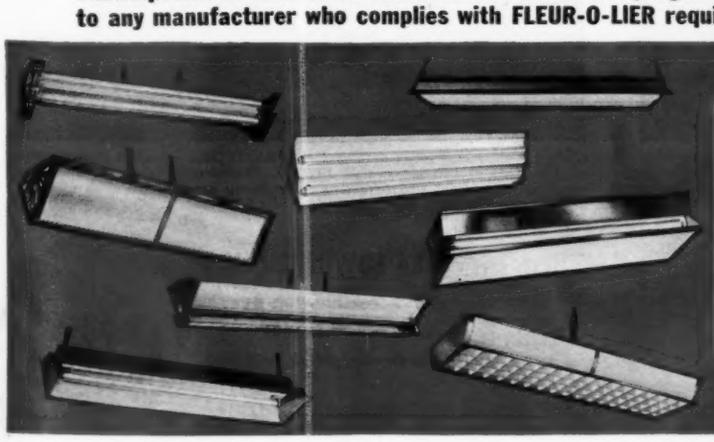
3 It means fixtures that use control equipment (ballasts and starters) which are *certified* for balanced performance.

4 It means fixtures backed up by strong national advertising, which helps you sell faster.

GET THESE TWO NEW BOOKS FREE!

Send in coupon and books will be mailed promptly with list of manufacturers.





TEAR OUT AND MAIL

Fleur-O-Lier Manufacturers • 2122-3 Keith Building, Cleveland, Ohio

Please send me helpful information about Certified★ FLEUR-O-LIERS, packages of indoor daylight for stores ☐ offices ☐ factories ☐

Name _____

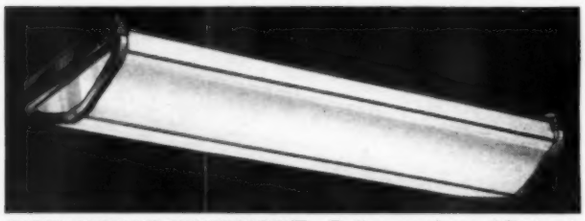
Address _____

City _____ State _____

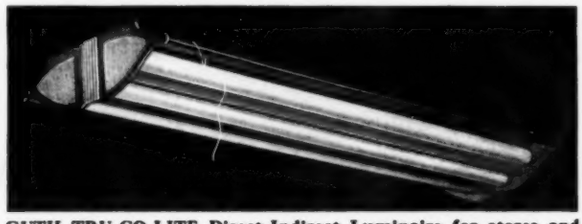
When I Show Mr. Prospect these 5 Advantages, He's all Ready to BUY!

Guth FLUORESCENT

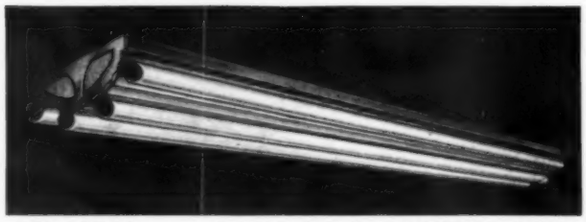
Advantage No. 1	Advantage No. 2	Advantage No. 3	Advantage No. 4	Advantage No. 5
ALZAK Reflectors	**Easy Maintenance**	**Low Cost Installation**	**GUTH Engineering**	**P-F-C Diffusers**
GUTH Fixtures have Reflectors of *Diffuse* ALZAK Aluminum—the world's finest, most practical material for Fluorescent reflection.	The *Diffuse* ALZAK Aluminum Reflectors in GUTH Fixtures are easily removable for safe, easy cleaning on the floor or at the bench.	We make careful plans from the *customer's* point of view, thereby reducing needless expense and time-wasting steps in installation.	A complete line of Fixtures to meet every need—each Fixture carefully designed to assure complete control and efficiency in lighting.	The best door-opener in the Fluorescent business! Dealers everywhere say the GUTH P-F-C makes it possible for them to sell the "toughest" prospects.



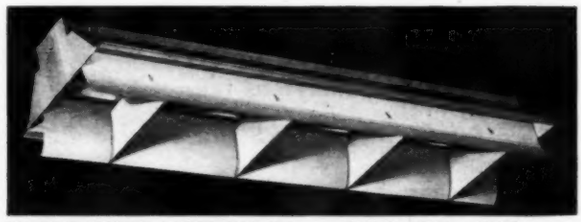
GUTH EXCELUX FLUORESCENT—Full-screen lamp diffusion is effected with either Glass or Plastic Shield—at same low cost: An ingenious hinged arrangement releases the shield at one end for access to lamps, starters, and covers.



GUTH TRU-CO-LITE Direct-Indirect Luminaire for stores and offices. The ultimate in fine styling—plus more light output with individual *Diffuse* ALZAK Aluminum Reflectors for each lamp.



GUTH GLOW are constructed with elongated flutings of Satin ALZAK Aluminum to harmonize with the characteristic design of Fluorescent Lamps. Cast Aluminum Ends.



GUTH TROFFER LIGHTING: Patented Light-O-Day Baffles provide ceiling illumination in recessed installations. Also Troffers for Glass Bottom or Plastic Diffusers. Innards easily accessible.

GUTH UTILITY FLU-O-FLECTORS for 2-40 watt, 3-40 watt, 4-40 watt and 2-100 watt lamps stand up under hardest use—do a better lighting job. Removable ALZAK Aluminum Reflector for easier maintenance.

GUTH ONE and TWO LITE FLU-O-FLECTORS—either Symmetric or Asymmetric Reflectors of ALZAK Aluminum—for localized or general industrial illumination. For lamp sizes from 1-20 watt to 2-40 watt inclusive.

ALZAK ALUMINUM REFLECTORS

Sell GUTH Fluorescent Fixtures with *Diffuse* ALZAK Aluminum Reflectors for better satisfied customers. Durable, easy to clean, more efficient!

AL ZAK, the Kid with the Extra Punch, says:

Diffuse ALZAK is applied to GUTH Fixtures after forming, to assure a more durable job and provide a better appearing finish.

The EDWIN F. GUTH CO.
2615 Washington Ave.
St. Louis, Mo.
Leaders in Lighting Since 1902

Guth

INSURE YOUR FLUORESCENT LAMP INSTALLATIONS WITH JEFFERSON *Ballasts*

TO LINE (GRD.)
TO NO 2 SOCKET
CONNECT OTHER SIDE OF LINE TO OTHER TERMINAL OF NO 2 SOCKET
JEFFERSON ELECTRIC COMPANY
BELLWOOD, ILLINOIS
TO NO 1 SOCKET
TO NO 1 SOCKET

The illumination in the general offices of Cribben & Sexton, Chicago, was greatly improved by the installation of fluorescent lamps. Jefferson Ballasts used throughout. Photo, courtesy Curtis Lighting Co.

THE improvement in illumination provided by fluorescent lamps is universally recognized. The satisfactory service and performance, however, depend greatly on the design and quality of the ballasts employed with them.

● It is here that Jefferson's quarter-of-a-century specialized experience is important,—experience with chokes, transformers for luminous (Neon) tubing, mercury lamps, X-ray lamps, street lamps, and the like.

● Jefferson engineering, research and manufacturing craftsmanship insure correctness of ballast design and uniform construction quality, for better fluorescent lamp performance. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 60-64 Osler Ave., W. Toronto, Ontario.

Jefferson Ballasts are made for the following lamps, 4, 6, 14, 15, 20, 30, 40 and 100 watts.

NEW BULLETIN 411FL
. . . contains complete data on the Jefferson Line of Ballasts.

JEFFERSON *ELECTRIC* FLUORESCENT LAMP *Ballasts*

CERTIFIED BY ELECTRICAL TESTING LABORATORIES

To insure the maximum life and performance of fluorescent lamps, the manufacturers of the lamps have given the Electrical Testing Laboratories of New York rigid specifications for fluorescent lamp Ballasts.

All Jefferson Ballasts coming within the scope of these specifications have been certified by "E. T. L." and are so marked.

Your self-interest and the ultimate satisfaction of your customer should prompt you to be sure you get Ballasts with the "E. T. L." Certification label or insignia stamped in the case.

●

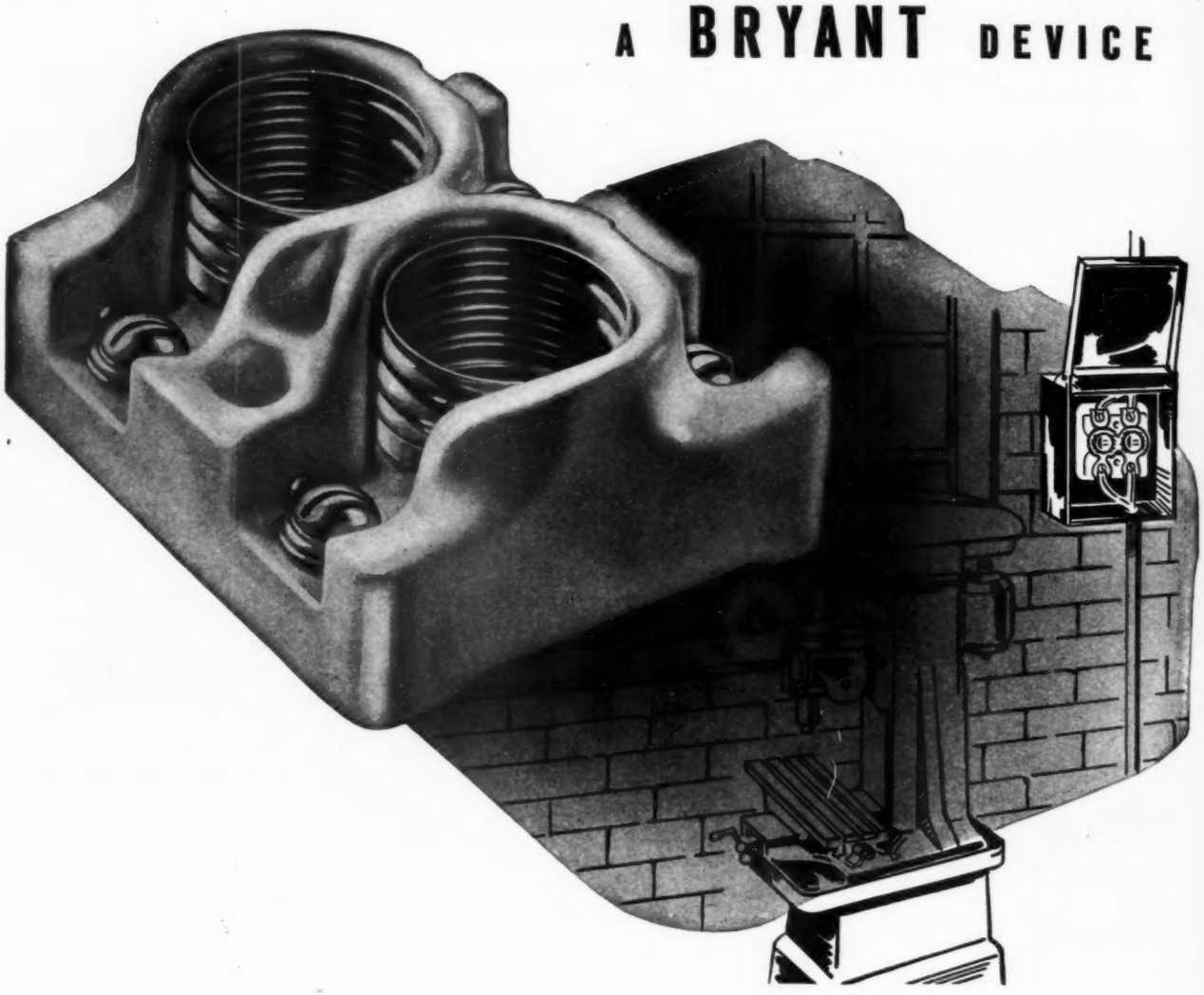
Jefferson Electric Certified Ballasts are used in Certified Fleur-O-Lier and RLM fixtures to operate efficiently with fluorescent lamps for which they are designed. This is important because it means that all parts are balanced for economical and satisfactory operation.

Listed as Standard by Underwriters' Laboratories, Inc.

All Jefferson fluorescent lamp ballasts and manual type switches are listed by Underwriters' Laboratories, Inc., and carry the Underwriters' label.

EVERY OUTLET DESERVES

A **BRYANT** DEVICE



BRYANT

SUPERIOR WIRING DEVICES

CUTOUT BASES

A fuse being the sentinel of an electrical circuit, a cutout base is the sentry box. That is why every Bryant Cutout Base, from simple plug fuse base to 600-ampere switchboard type, is built for the same dependability as the fuse it will hold. Then, in that split second when circuit protection depends upon the fuse in the cutout base, the Bryant Cutout Base will be ready to do its part.

The Bryant Electric Company
Bridgeport, Connecticut

ADEQUATE WIRING SERVES AND SAVES

SOLD THROUGH ELECTRICAL WHOLESALERS NATIONALLY

Since 1901 a subsidiary of WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

STERLING REFLECTOR PHOTOS

Retail business is humming right now—store owners' minds are receptive to lighting modernization. You can cash in on this ready, profitable market with Sangamo Time-Switches. Because they are low in cost, yet provide many advantages, such as automatic convenience, punctuality, and dependability in controlling store-front lighting — Sangamo Time-Switches make order-getting easy when used as the initial step. Then, the installation of the time-switch brings opportunities to check on wiring, reflectors, fixtures, sockets, etc. . . . a chance to get better acquainted . . . and add another regular customer.

Form KA, a sturdy, dependable time-switch, ideal for installations where no variations are required from a regular daily sequence.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

CLEAR THAT BOTTLENECK

AMERICA'S LEADING INDUSTRIES ARE STEPPING UP PRODUCTION WITH BULL DOG BUS DUCT SYSTEMS

Parallel installations of Bull Dog BUStribution DUCT and UNIVERSAL Trol-E-Duct furnish power and light for this battery of machine tools.

"How can we speed delivery?" is the burning question of the day. To help find the answer, the leading producers of American industry have turned to Bull Dog flexible light and power distribution systems.

Why? Because Bull Dog BUStribution DUCT for power — UNIVERSAL Trol-E-Duct for light — and INDUSTRIAL Trol-E-Duct for portable tools or moving "loads" save many precious minutes of production time.

Speed in installation, speed in expansion or rearrangement, complete salvability, and, above all, the ability to plug in for light or power *anywhere at any time,* are just a few of the many ways these Bull Dog systems save time and money for all types of industry.

Complete illustrated bulletins describing these BUS DUCT systems, as well as the entire line of Bull Dog time-tested Standard Products, will be mailed on request.

BULL DOG ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
Bull Dog Electric Products of Canada, Ltd., Toronto, Ontario

Originators of Flexible Electrical Distribution Systems

MANUFACTURERS of Vacu-Break Safety Switches, Panelboards, Circuit Master Panels, Switchboards, Duct Systems—FOR LIGHT AND POWER

electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

Member A.B.C. - Member A.B.P.

CONTENTS

MARCH, 1941

13—Tuff, Thank God!—*An Editorial*

15—REA Progress in Terms of Wiring—*By J. R. Cobb*
—A report to the electrical contractor on the wiring accomplishments in this rural field and the opportunity offered for future business.

18—Semi-Vault for Outdoor Transformer—*By F. J. Bray*
—An ingenious method used to meet difficult conditions at a rock quarry as described by a New Jersey electrical contractor.

19—We Will Not Take the Blame—*By Earl Whitehorne*
—Some plain talk on the present chaos in the fluorescent lighting market and what should be done about it.

20—Ideas that Sell A Motor Shop—*By John B. Tufts*
—Sound business methods prove that a motor repair shop can sell its services as profitably as any other enterprise.

22—Budget Your Business—*By Arthur Roberts*
—A simple analysis of the value of a budget, how to set it up and use it to control expense and make profits sure.

24—Fluorescent Lighting in a Cannery
—How new efficiencies have been achieved in grading and inspecting fruit by the use of fluorescent lighting in a Hawaiian packing plant.

28—Editorials and Back Talk

49—Industrial Electrification—*A Feature Section*
—Providing Adequate Capacity for Increased Demands.

Departments

30—Wiring Methods
36—Better Lighting
42—Motor Shops
67—Estimating
70—Questions on the Code
76—In the News
94—Equipment News
114—Advertisers' Index

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, and residential.

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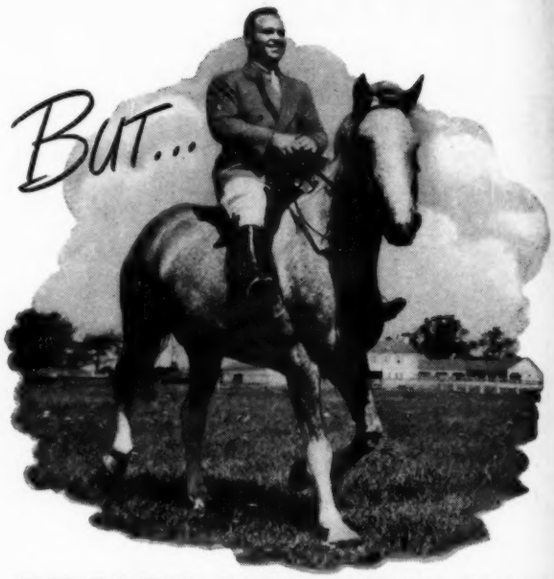

IT'S EASIER GOING WITH A SADDLE

•

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It's a lot easier to build new business . . . steadier and bigger electrical profits when you *use* those two handy, helpful little sales stimulators Anaconda has prepared especially for you.

They're called the "Industrial Wiring Survey" and the "Industrial Wiring Guide." Right now they're more valuable to you than ever. Why? Because today—according to authorities—nine out of ten industrial plants are in need of new wiring. Old, worn out circuits, overloading and failure to provide adequately for new equipment mean wasted money and possible electrical failure. What's more, most plant supervisors aren't aware of these conditions.

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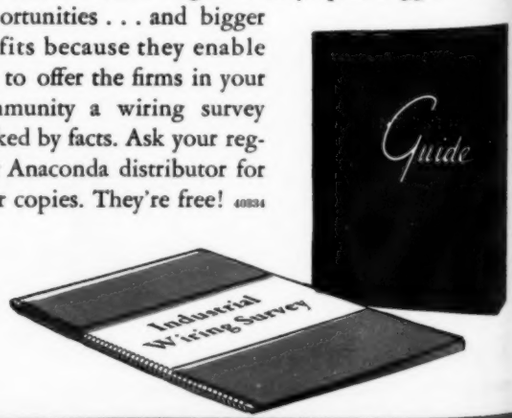


USE MODERN IMPROVED **Anaconda Wire & Cable**

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

electrical contracting

MARCH, 1941

Tuff, Thank God!

A HOTEL ROOM PARTY at a recent gathering of electrical contractors, was panning the 1940 code. "Why Hell!" said the Chief Squawk, "These new rules on temperature rating and conduit-fill and new wires have messed up this whole business. We'll have to learn it all over again."

THEN A SILENT EGG in the corner spoke up and the truth spilled out—"We ought to thank God," he said, "For if it troubles us, how about our incompetent competitors? We ought to be glad that something, at last, is making it tough to get into this business."

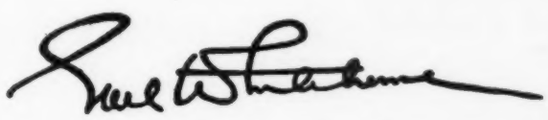
IRRESPONSIBLE COMPETITION HAS ALWAYS CURSED the electrical contractor. For anybody with a pliers, hack-saw and screw-driver can go out and get small wiring jobs, if his price is low enough. So, in bad times every unemployed journeyman is seeking an honest dollar this way. In good times they work nights to get a little extra jack.

THIS IS ALL RIGHT, as a matter of privilege. God help America if the path to any business enterprise is ever blocked to the ambitious man. But there is more to it than that. For to succeed as a contractor, you must not only know the tools and the trade. You must also have the qualities of a business man. There comes the pinch.

WHEN A WIREMAN STARTS CONTRACTING FOR WORK, he takes on the problems of selling, management and finance. And if he is not competent as an organizer and an executive, he will make no money. Then he would be far better off as a well paid foreman on the safe payroll of some established contractor, who needs him.

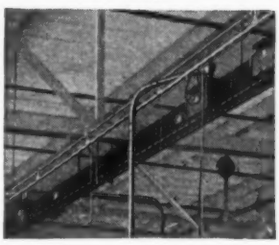
MEN TALK OF THE "SMALL" CONTRACTORS as a problem. I see no conflict here. The small business has its place in every field. It lacks neither rights, dignity nor importance. The only valid contrast lies between those who are competent and responsible and those who are not. For those who fail in their unhappy struggle cheapen and destroy the values of the services of those whose work is good.

THIS IS AN INDUSTRY PROBLEM as I see it. For the electrical manufacturer, wholesaler and power company are all involved. And the service of the public is concerned. There should be in every city qualifications that every contractor must meet if he is to receive credit, confidence and recommendation—and a leader in any city can set it up. Licensing is an essential. But the question of business competence is a vital part of it.



DO YOUR PLANS FOR PLANT WIRING SHOW THESE SIGNS OF *Profit Improvement?*

Bull Dog BUStribution Duct



This modern enclosed bus-bar distribution system for low tension industrial service is made up in standard 10-ft sections, the bus bars being mounted on insulators within a steel (or in some types, aluminum) casing. A simple bolting operation connects sections together. Openings spaced at convenient intervals in the "Plug-In" DUCT provide for branch circuit plug-in devices. The complete line of standard plug-in devices includes switches, fuse boxes, circuit breakers, etc. Convenient auxiliary fittings, tees, crosses, adaptors, make the system easy to install, convenient to alter or extend. (Bulletin BD403 gives details.)

Bull Dog Trol-E-Duct

This enclosed system gives unmatched flexibility for power take-off. Lighting units, receptacles for electric hand tools and outlet boxes are mounted on movable trolleys that can be rolled along the DUCT as required. Or twist-out plugs snapping in place anywhere along the line may be used. For plants where rapid changes in plant layout, lighting and the like may be necessary, for cranes, hoists and other "moving" electrical loads, Trol-E-Duct is the ideal system. (Bulletins BD386-407.)

N.E.P. "La-In" Surface Raceways and Plug-In Strip

Here's the flexible, economical wiring system for offices, drafting rooms, and the like at a time when change and expansion is the order of the day. A variety of types, including metal molding, Xtensionduct, Florduct, and plug-in strip for along baseboards meets all needs for lighting, office machines, etc. A full line of fittings and accessories gives the system extra serviceability. (Write GRAYBAR for *La-In* Handbook.)

Rigid Conduit . . . Thin-Wall Conduit . . . Small Diameter Building Wire . . . BX Cable . . . Wiring Devices and Supplies for every industrial or commercial application are "Distributed and Guaranteed by Graybar."

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- ★ Satisfactory profit margins
- ★ Less "cut-price" competition
- ★ Fewer installation troubles
- ★ Greater user satisfaction

You're ahead of the game from the profit standpoint when your industrial jobs call for the use of modern electrical distribution systems such as those shown here.

These new ways of getting power distributed to lighting units, motors and other electrical equipment help take the jobs out of the ordinary run-of-mill class where cut-price competition is most likely to be encountered. They give you new talking points for a job that's top-grade throughout. And after the job is completed, you're sure of the kind of user-satisfaction that encourages an extension of wiring modernization.

GRAYBAR offers a complete service on these new systems and methods, (those illustrated and many others) along with all the regular wiring supplies you need for any sort of industrial, commercial or household job. Your GRAYBAR Man is ready to give you the information on application data, specifications, prices. Or, if you wish, write for free bulletins (described at left) to Graybar Electric Company, Graybar Building, New York, N. Y.

GraybaR — QUALITY — *Everything Electrical* — GraybaR ELECTRIC COMPANY

GraybaR . . . *in over 80 principal cities*

REA PROGRESS
In Terms Of Wiring

The growth of government financed rural lines and the part the electrical contractor has played in putting this new power into use. Growing opportunity in this work.

By J. R. Cobb*
Rural Electrification Administration

PROGRESS of the Rural Electrification Administration's program of Federal financing for large-scale rural electric system construction has brought great impetus to the work of many electrical contractors. As of November 30, 1940, 669 REA-financed systems, comprising 262,850 miles of lines, had been energized and were actually serving 663,000 farm families and other rural users. The loans with which these lines were built totaled approximately $252,000,000. An additional 100,000 miles are in various stages of design or construction. REA allotments to the end of 1940 had reached a cumulative total of more than $350,000,000, which will make electric service available to well over a million potential users.

Farmers had to have low-cost electricity if they were to have it at all. The first possible reduction in cost appeared to be in construction costs. Through new engineering practices, new designs, "assembly-line" construction, and modern planning, costs have been greatly reduced. More line can be built and more farms served.

In 1935 rural lines cost from $1,500 to $2,000 per mile. Today that same amount of money will build from two to three miles of strong, serviceable rural line. Some REA systems have built lines at less than $600 per mile. The adoption of similar construction methods by privately owned utilities has further extended their rural lines.

House Wiring Growth

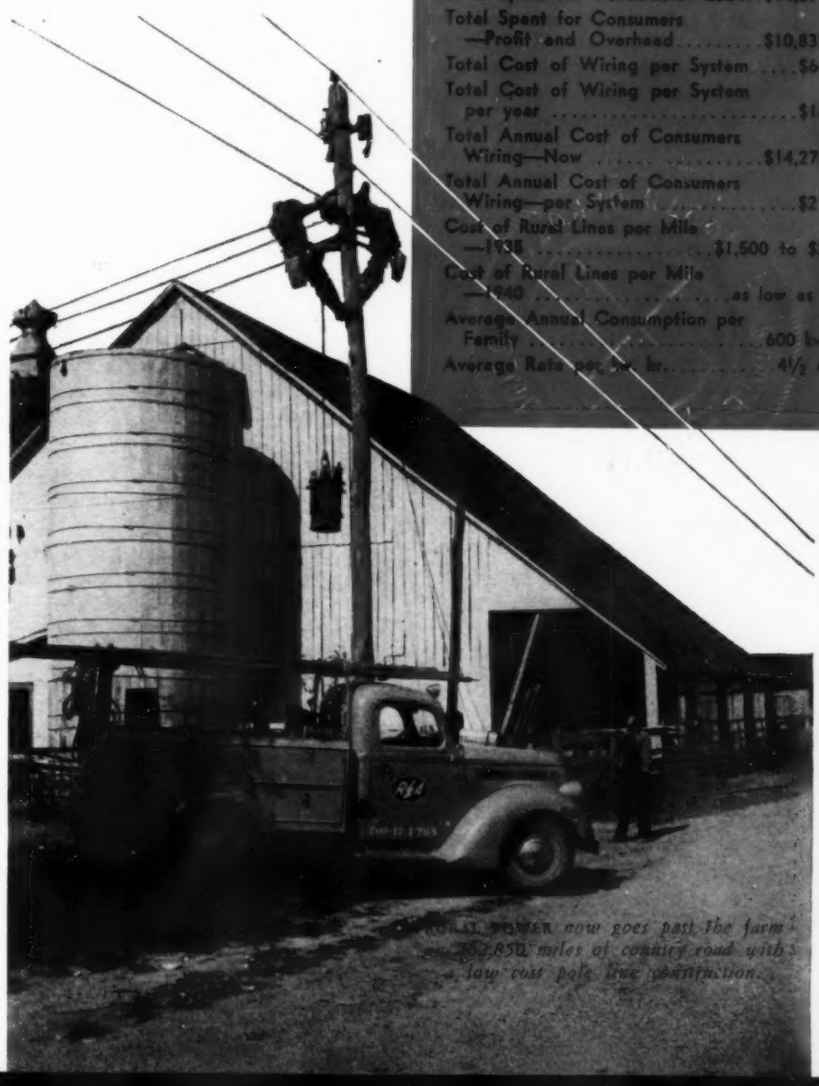
The electrical wiring of consumers' premises up to October 31, 1940, cost approximately $43,109,000. This figure represents approximately $18,000,000 for materials, including wire and cable, boxes, switches, receptacles, service heads, ground rods and other equipment; $14,277,000 for labor; and $10,832,000 for profit and overhead.

Though REA was set up in 1935, actual wiring of consumers' premises gained practically no headway until about October 1936. The above figures on wiring therefore cover about four years' operations. On the basis of 669 energized systems in October 1940, the average outlay for wiring has been $64,000 per system, or $16,000 per system per year.

Line construction and house wiring completed during the past two years was almost twice as great as that completed during the first two. A rough estimate of the cost of wiring of consumers' premises now being done on REA systems would therefore be $14,278,000 per year, or $21,340 per system

R.E.A. PROGRESS AFTER SIX YEARS OPERATION

Cooperative Systems in Operation	669
Miles of Lines Completed	262,850
Miles of Lines in Prospect	100,000
Average Miles per System	393
Number of Families Served	663,000
Number of Consumers per Mile	2.5
Total Loans to Cooperatives	$252,000,000
Total Allotment to Cooperatives	$350,000,000
Total Spent for Consumers Wiring	$43,109,000
Total Spent for Consumers—Mat.	$18,000,000
Total Spent for Consumers—Labor	$14,277,000
Total Spent for Consumers —Profit and Overhead	$10,832,000
Total Cost of Wiring per System	$64,438
Total Cost of Wiring per System per year	$16,000
Total Annual Cost of Consumers Wiring—Now	$14,278,000
Total Annual Cost of Consumers Wiring—per System	$21,340
Cost of Rural Lines per Mile —1935	$1,500 to $2,000
Cost of Rural Lines per Mile —1940	as low as $600
Average Annual Consumption per Family	600 kw. hr.
Average Rate per Kw. hr.	4½ cents



RURAL POWER now goes past the farm of 262,850 miles of country road with a low cost pole line construction.

* Mr. Cobb was for three years a regional representative for REA in touch with wiring and plumbing installations. He is an electrical engineer and an agricultural engineer and is now in charge of the Installation Loan Contract Section of REA.

WIRING UP *the farm home has become a mass production job where electrical contractors work on lots of 25 or more houses with standard methods.*

DISTRIBUTION *for the farm is from a pole in the yard that bears a floodlight and the meter. Here a single phase, 3-wire service connects the house, from which point switched circuits run to the farm buildings.*

per year. What the Government's rural electrification program means to electrical contractors can be gauged from the significant fact that the $14,278,000 worth of wiring a year on REA systems is $1,320,000 more than the cost of all other residential wiring in the United States during 1939.

During recent years many electrical contractors have profited by participating in the vast market presented by this increased business. It is believed, however, that the greater majority have yet to realize the possibilities that exist in this market that is being created by the Rural Electrification Administration. Yet the market is made all the more attractive by many improvements during recent years that have been made to benefit the consumers, the contractors, the systems and the manufacturers.

Early Problems

When REA program was initiated and until May 1937, there was little uniformity in the wiring of consumers' premises in rural areas. Specifications on rural wiring had not been nationally standardized, and no inspection of wiring was required by REA. Two of the States had rural wiring codes or provisions for inspection of rural wiring.

Frequently consumers were wiring their own premises without any experience or instructions on how to install wiring properly for 115-230 volt systems. Much of the wiring was being done by local crossroads mechanics, many of whom had never seen a National Electrical Code, or had any greater experience than the consumer. Such wiring was sometimes hazardous. Splices, boxes, switches, grounds, even the wire, were often risky makeshifts.

For this type of wiring consumers were often required to pay exorbitant prices. No nationally organized standards for providing safe and satisfactory wiring, done at a reasonable price, had been made available for the consumer.

In an attempt to overcome these conditions, several local organizations prepared and enforced wiring rules and regulations, many of which were not in the public interest. Much confusion resulted because of the differing character of these rules. In some cases requirements were unnecessarily restrictive. In a few cases the regulations were so written that only certain manufacturers, distributors or contractors could comply. Such conditions had to be rectified in the interest of the new consumers. Above everything else, it was imperative to protect the farmer from the hazards of unsafe wiring about which he had little knowledge.

In May 1937, REA organized a wiring program. A set of specifications was prepared based on the National Electrical Code. Those provisions of the Code not suitable to rural areas were eliminated. Compliance with these specifications was required on all REA systems, thus providing a uniform standard for all contractors to follow.

Qualified Inspectors

But specifications were of no value without means of enforcing the regulations. So REA issued instructions that before service could be rendered to a consumer the wiring must be inspected and approved by a qualified inspector acceptable to REA. In those States where State laws provided for wiring inspection or where the Underwriters were able to carry on inspection, these agencies were used by REA. In most States, however, it was necessary for REA to create an inspection system.

Properly qualified applicants were located and required to pass a written examination, taken under the supervision of the State Fire Marshal, Underwriters' organization, or REA representative. The applicant selected was required to have the necessary technical ability and the proper personality to promote good will and cooperation on the system. In those States where proper arrangements could be made, inspectors operated as Deputy Fire Marshals; and in other States, as independent agents, supervised by REA.

Compensation for the work is on a fee basis, the amount established by system officials and inspector, $2.50 being the maximum permitted. The inspector is required to test each installation, using a high voltage test set, for short circuits, grounds and polarity. Also a visual check is made to determine the grade of materials used and to see that all joints are properly made. This service assures the members that their installations have been made in a safe manner, free from any hazards. This further provides fair competition for contractors.

Group Wiring Cuts Expense

Schools for training local wiremen and contractors were held on all systems to teach them how to do wiring in accordance with Code requirements. A group wiring plan which was then developed and suggested to the systems put wiring on a mass production basis.

Before the adoption of this plan, wir-

ing prices ranged from $2.50 to $5.00 per outlet and from $10.00 to $25.00 for service entrances, depending on the section of the country, the type of wiring and the size of service entrance. One of the reasons for such high prices rested in the old fashioned and planless way in which many contractors did their work. They were soliciting business over a wide area without any standard on which to bid, buying materials in small quantities at high prices, and working in widely separated areas. This caused loss of time and increased expense in traveling between shop and job. The group wiring plan has eliminated these defects.

Under this plan, the system officials obtain a bonafide wiring contract from each consumer, instead of having all contractors solicit and compete on each job. The contracts obtained from the consumers are based on maximum unit prices. Bids taken from the wiring contractors are based on a group of 25 or more houses. The lowest unit bids received from a responsible contractor are then used as a uniform price schedule for all wiring. The groups of premises to be wired are then divided among the participating contractors in accordance with the size of their organizations and the amount of wiring each can complete within a given period.

As a result of the economies thus effected in obtaining and performing their contracts, electrical contractors have found it possible to make ample money on these jobs. At the same time they pass along to the consumer a large share of the savings. Working on this basis, they have reduced prices to $1.50 and $1.60 per outlet and $5.50 to $12.85 per service entrance in most States. Besides reducing costs to the contractor as well as the user, the group wiring plan placed wiring on an orderly basis so that system officials could arrange for their wiring to keep pace with line construction.

New Procedures

The wiring problem which confronted REA in 1937 was unique. Never had such a large scale operation been undertaken under such unusual conditions. Old methods and practices had become ingrained in consumers, contractors and system officials. It took time to get these people to see the value of these new procedures. It took time to locate and train a crew of some 500 qualified inspectors. Naturally many of the inspectors proved unsatisfactory due either to personal inability to get along with rural people or to lack of technical skill. These misfits were gradually weeded out. Generally speaking the present crew of inspectors are well trained men, doing a good job in the interest of the public.

At first there was some opposition to inspection, until those concerned learned of the great value they were receiving from inspection. Now, generally speaking, inspection is universally accepted.

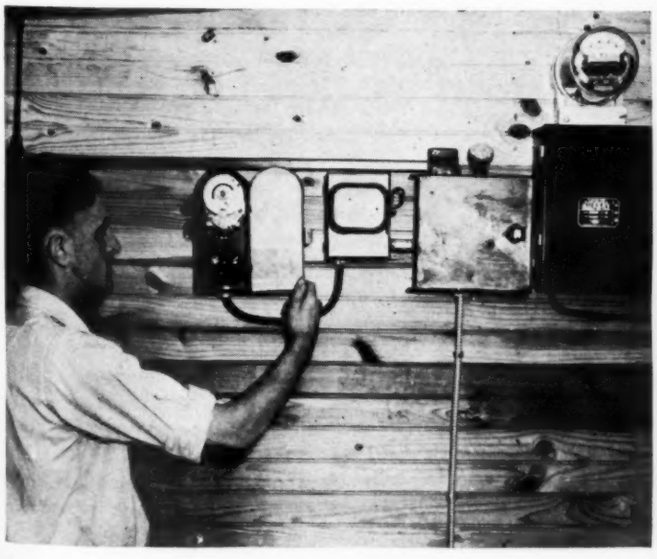
During the last year about 2000 qualified contractors have participated in the wiring activities wherever the group wiring plan is adopted. Reports from these contractors state they make more money under this plan at the low prices than they could make by soliciting the work at considerably higher prices. About 50 contractors have made a specialty of doing REA wiring in all sections of the country, and are practically confining their activities to this work.

The successful contractor participating in REA wiring uses all the local labor available. In many instances, the local wiring contractors prefer to work for the larger contractor who is operating on a national basis, with greater purchasing power.

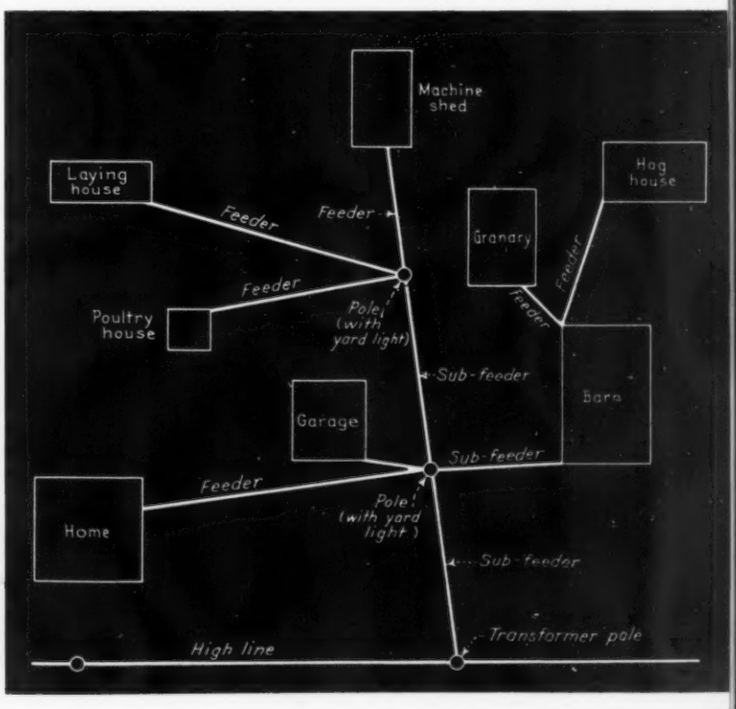
Naturally the contractor must take the initiative to make a success of this work. He must visit the system officials, help sell them on the value of the group wiring plan, and offer to participate in this plan. He must be cooperative and helpful to the consumer, offering sound advice on the installation of a wiring job adequate to care for future needs. He should be familiar with farm uses of electricity, and the costs of operating all kinds of electrical farm equipment. He should be familiar with the REA long-term financing plan, so that if the consumer needs assistance he can persuade the consumer to use this plan, thereby obtaining a satisfactory installation in all buildings at the low costs made possible by group installations.

Skilled and reputable contractors are accustomed to giving their customers such help and advice. Others will find REA work a lucrative field.

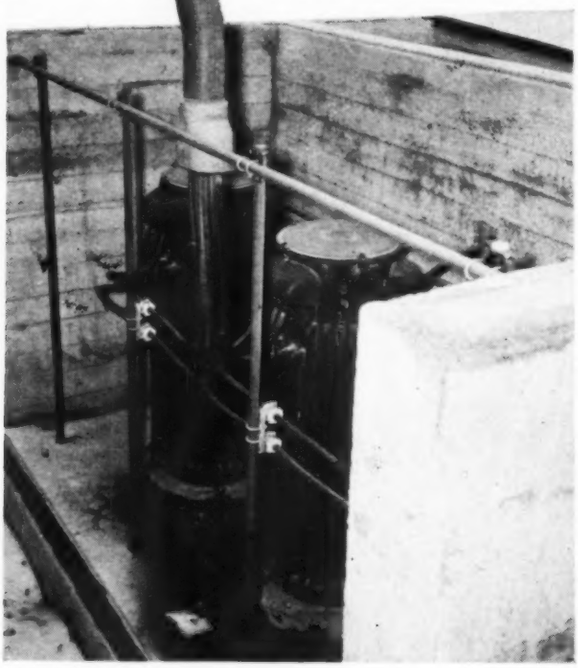
CONTROL *is centered in a convenient enclosed spot where switches, fuses and the time control for poultry houses are protected.*



TYPICAL LAYOUT *for a modern farm installation where every building is connected from a central distribution, under convenient central and local control.*



SEMI-VAULT for OUTDOOR TRANSFORMERS



BEHIND PROTECTIVE *walls, these three 150 kva., oil cooled transformers rest on a 14-ft. by 7-ft. concrete mat. Cable is used throughout so no live parts are exposed.*

This open type concrete vault saves space and protects equipment in this rock quarry. It can easily be converted to a totally enclosed vault for primary service requirements.

By Frank J. Bray

E. J. White Company, Newark, N. J.

WHEN an increased connected load and higher demand required more transformer capacity at the Orange Quarry Company, West Orange, N. J., the problem of available space became acute. Present business conditions pointed to a larger load and the possibility of primary service and metering in the future.

The local power company recommended the construction of the standard type of outdoor transformer mat with a wire fence enclosure. For the three new 150 kva., 4150/440-volt single phase transformers considered, this would require approximately 384 square feet of space. But there was no room for such a mat.

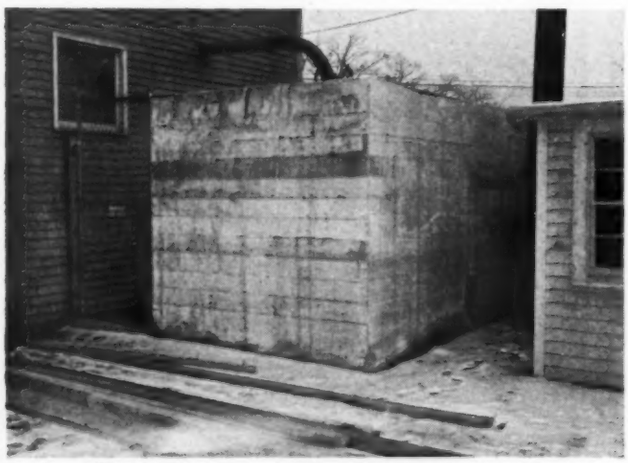
So, the E. J. White Co., of Newark, N. J., electrical contractor on the job, suggested the installation of what might be called a semi-vault—that is, a small concrete mat enclosed by concrete walls. This was done with the permission of the local utility and the inspection bureau.

This semi-vault consists of a concrete mat 14-ft. by 7-ft. by 12-in., cast five feet away from and parallel to the building wall. A six-inch concrete sill is provided on the building side of the mat to retain the oil and a dry drain built into the mat carries off any moisture that might accumulate. The mat is enclosed on three sides by a 12-inch concrete wall, 9-feet high. A five-foot wire gate in one of the walls near the building, which forms the fourth side of the enclosure, gives access to the equipment. The total area covered is 12-ft. by 14-ft. or 168 sq.ft. as compared to the 384 sq.ft. necessary for the conventional outdoor mat.

A 4-inch service conduit drops from a pole mounted outside the mat and goes through the concrete wall in a 5-in. sleeve located in a slot to take care of any sway the pole might have. A 24-in. by 24-in. opening and grille is cast in the wall opposite the building to provide air circulation. Pipe racks support the primary and secondary cables which enter the enclosure in conduit.

This semi-vault is so constructed that a roof slab can easily be installed in the future and the gate replaced by a door. In addition to being lower in cost than the conventional outdoor mat, in this particular case, this enclosure provides adequate mechanical protection against trucks backing into the transformers or any intentional damage directed to hamper production.

This type of construction should prove applicable to many factories. Where space for outdoor transformer equipment is at a premium and where protection against sabotage is important, it is worth considering.



CONCRETE ENCLOSURE *provides a semi-vault for the protection of these transformers and requires less than one-half the space necessary for the conventional mat.*

YESSIR! *I've sold every store on this block. Now when do you want these delivered?*

We Will Not Take the Blame!

Some plain talk on the present chaos in the fluorescent lighting market and what should be done

By Earl Whitehorne

SOME manufacturers of fluorescent lighting equipment are squawking at the electrical contractor. They are calling him the cause of the present unhappy situation in the market for fluorescent lighting. And it doesn't make sense.

Therefore, unbidden, I rise to declare that the electrical contractor will not take the blame. It is not his fault. And it is neither his function nor his responsibility to take the only constructive action that is in sight to correct the present lamentable condition.

Let us consider frankly what it is all about—

1. The Cause

By rare good fortune and the inherent appeal of fluorescent light itself, this new lamp has made a spectacular hit with the public. It has become a fad. And suddenly there has arisen a vast army of men who are trying to ride this fad to glory.

Many alert manufacturers, inexperienced in the lighting field, are making reflectors and assembling sockets, starters and ballasts and are out after the national market. And for everyone such, there are a dozen local manufacturers in important cities. And on top of this, hardware, drug, grocery and other jobbers have gayly taken on a fluorescent unit as a side line.

All these opportunists—strangers to our market place—are hiring high pressure salesmen. I found the five ads reproduced here in a morning paper in New York the other day. You see them in any large city. And as a result, door-to-door salesmen are out over the country like a swarm of locusts.

Most of them know little of lighting. But with a shining-unit under their arms, they are working the merchants in every town on the hit-and-run basis.

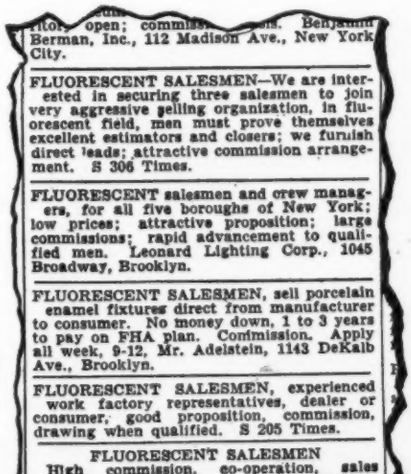
Now, when the established lighting unit manufacturers see this, they feel pretty bad. I don't blame them. Here is a rich new market being stolen under their eyes. They feel that somebody should do something about it. Some say that the contractor, by aggressive selling, should have shut out these grasshoppers who are eating up the business.

But what would they have him do? Should he hire more high pressure peddlers for quick cold-turkey selling round the town?

The electrical contractor does not, should not, will not work that way. It is not the sound way. He is right now selling thousands of fluorescent units throughout the country. But he is selling them as lighting—not as bargains in hardware.

He is selling them soberly and conscientiously as a new development in lighting should be sold. And therefore, to be safe, probably he is selling somewhat slowly. For, when you sell lighting, each customer's problem should be studied and the job should be accurately engineered and properly installed.

But something can be done to right this deplorable situation. And to me it looks fairly simple. But frankly it puts the bee back on the manufacturer himself.



FLUORESCENT SALESMEN—We are interested in securing three salesmen to join very aggressive selling organization, in fluorescent field, men must prove themselves excellent estimators and closers; we furnish direct leads; attractive commission arrangement. S 306 Times.

FLUORESCENT salesmen and crew managers, for all five boroughs of New York; low prices; attractive proposition; large commissions; rapid advancement to qualified men. Leonard Lighting Corp., 1045 Broadway, Brooklyn.

FLUORESCENT SALESMEN, sell porcelain enamel fixtures direct from manufacturer to consumer. No money down, 1 to 3 years to pay on FHA plan. Commission. Apply all week, 9-12, Mr. Adelstein, 1143 DeKalb Ave., Brooklyn.

FLUORESCENT SALESMEN, experienced work factory representatives, dealer or consumer, good proposition, commission, drawing when qualified. S 205 Times.

FLUORESCENT SALESMEN
High commission, co-operation, sales plentiful, new method. 2d floor, 36 W. 15th.

GIFTWARE SALESMEN

WANT ADS *like this are appearing in every large city and these peddlers go out selling not light—but a bargain offer.*

2. The Cure

The present trouble in the fluorescent market is that merchants and other local buyers do not realize that they are buying lighting—not just a fixture. And so they permit themselves to be deceived and exploited. The only way to correct this unfortunate situation is to warn these merchants so they will protect themselves.

But the electrical contractor can not go from store to store, from factory to factory with this message. The cus-

[Continued on Page 112]

IDEAS that SELL a MOTOR SHOP

To many motor repair shops, advertising is an unknown quantity. But, like any other business, shops need promotion—of the type that characterizes responsibility and good service. Here are six ways to win and hold good customers.

By John B. Tufts

President, Electric Motor Repair Co., Springfield, Mass.

THE stumbling block to so many present day motor shops is the lack of salesmanship and sales promotion. True, we have an intangible service to offer the customer. But that shouldn't prevent us from applying the basic business principles employed by other enterprises. A well organized sales promotional program is just as important to the motor shop as to the manufacturer. It should be a part of every motor repair business.

Of what does such a promotional activity consist and how can it be operated? Well, we have found the following points to be important aids in the promotion of our motor repair shop. Although the first three may come under the heading of "good housekeeping," they have a direct bearing on shop promotion.

1. *A Good Location*—A centrally situated, easy-to-get-to location is a definite asset. Also the shop should have plenty of working area, with good ventilation and lighting, both natural and artificial. Such conditions spruce up the morale of the workmen and reflect in higher quality workmanship and fewer mistakes.

Our shop, with an original work area of 1300 sq. ft., now has 13,500 sq. ft., with large roomy aisles and plenty of room around the equipment in each separate department. It makes a good impression.

2. *A Clean, Well Organized Shop*—A carefully organized, departmentalized shop improves the quality of the work, speeds up production and in general makes for efficient service, which, after all, is what we are selling.

Our shop has a separate office section divided into a clerical department and several private offices, one of which is for the exclusive use of our sales engineers. We have a spare parts and equipment stockroom, a wire and insulation stockroom, a machine shop, a stripping and cleaning department, a coil winding department, an assembly department and a testing department.

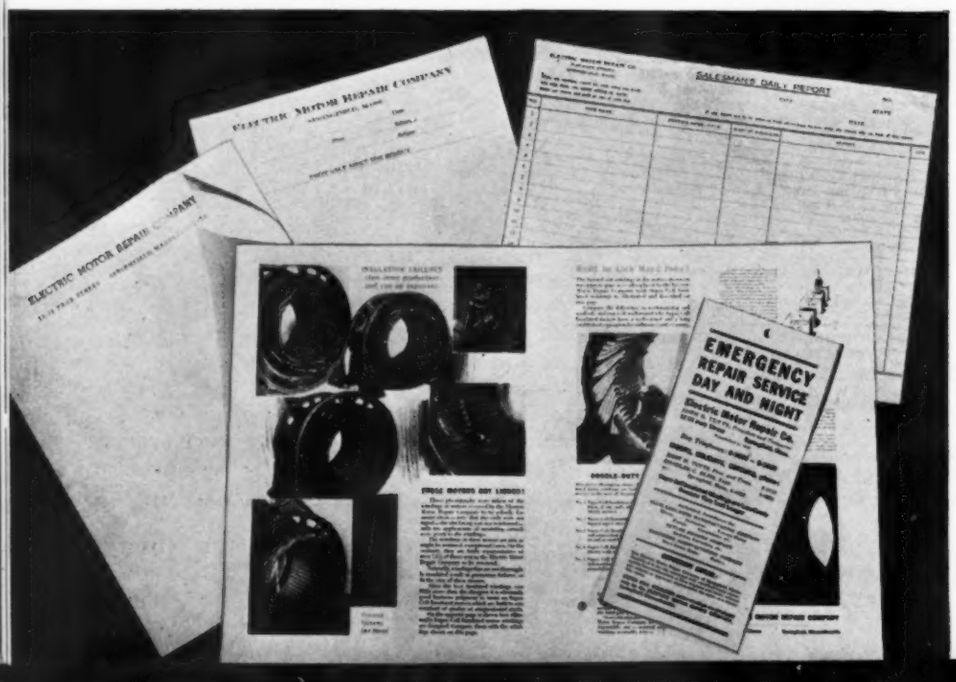
Shop cleanliness is always impressive. It is necessary. It reflects attention to detail, a point which we want to get across to our customers. It makes talk and salesmen who call on us also visit industrial plants who are our prospective customers. A good word from them sometimes goes a long way.

A clean, well organized shop also reduces overhead through lower compensation rates as a result of fewer accidents, lower fire insurance rates, less lost time looking for tools and general increased efficiency. All of which leads to lower cost and better service to the customer.

So our cement floors are swept at least once a day and mopped with a solution of Oakite and water at least once a week. Scrap material is placed in conveniently located barrels.

3. *Plenty of Equipment and Material Stock*—To do a job well, you must have plenty of the proper type of equipment and tools as well as material. For equipment is the backbone of the repair business. It creates customer confidence, raises the quality of the workmanship, reduces unit costs and facilitates better service.

When he sees a well diversified stock of wire, parts, accessories and spare equipment, the customer feels that he can depend on you in any emergency. This is especially important now, when material deliveries are uncertain. We have at present some 500 reels of different types and sizes of wire.



PROMOTIONAL LITERATURE *and sales reports used in the personal contact and direct-mail campaigns include: Salesmen's daily report; "immediate attention" form; emergency service card; advertising letterhead for general correspondence, similar type used for specific equipment; direct-mail advertising folder and envelope stuffers.*

SHOP CLEANLINESS *is the first impression left with a customer when he enters this spotless office and sales counter.*

CLEAN, LIGHT AND ROOMY *work areas, with plenty of equipment, help promote customer confidence in shop responsibility.*

4. *A Personal Contact Program*—Personal contact means much to the repair shop. Through it you can contact the right persons in the plants you desire as customers, the people whom you can help and who can help you. You can sit down, talk to them, listen to their problems. And if you can help them, you have made a valuable friend.

We have three sales engineers, employed on a salary-plus-expenses basis, whose sole duty lies in calling on industrial plants and other prospective customers. Being graduate mechanical or electrical engineers, they are qualified to help solve the customers problem in the field and, if necessary, make quotations on the spot.

Each salesman tries to make ten calls a day, five days a week, a total of 150 contacts per week. Our larger and more regular accounts are contacted at least twice a month, the others at least once a month and more frequently if possible. Our salesmen mail in daily reports of their calls to the office. Two forms are used. One covers each call made; the other, immediate prospects. The salesman lists only those firms on which he intends to call again and these names are added to our direct mail advertising list, which is constantly kept up to date. An "immediate attention" form, from the salesman comes to my desk and the prospect is answered at once. All field quotations are immediately confirmed. The salesman is always informed of the latest developments on any of his active prospects.

Before a salesman closes an interview, he leaves an "emergency card" listing our name, address; day, night, Sunday and holiday telephone numbers; names of president and superintendent and the manufacturers for whom we are authorized distributors. He also leaves book matches and quadrille ruled scratch pads with our name on them.

If possible, the "emergency" card is hung in a conspicuous place over the prospect's desk. It pays. During the last flood up here, a surprisingly large number of men came into our shop with these cards in their hands—customers whom, otherwise, we might not have had.

At the end of each month, each salesman is given a breakdown of his total sales for the month; the amount of his salary and expenses and a percentage figure showing the cost of making these sales. This shows him when he is slipping.

5. *A Direct-Mail Advertising Program*—All prospects the salesmen call on are sent follow-up letters on a four-page letterhead, three pages of which contain our company advertising. Quotations are also made on this stationery. If the prospect is interested in belts and drives, his letter is sent on a letterhead containing advertising data on this equipment.

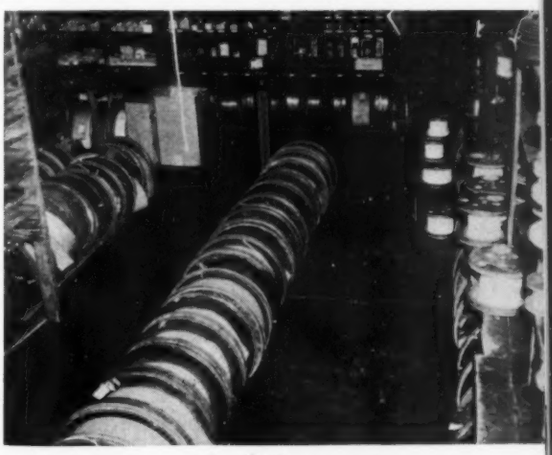
We also use envelope-stuffers consisting of manufacturers' literature, blotters and other pamphlets, imprinted with our name. Direct-mail pieces are sent with all invoices and statements.

One policy our shop adheres to, is to put the pressure on our direct-mail campaign when business is poor. Most shops think that this is the time to let up. But we have found it results in more business per salesman's call and thus our overhead increase is slight. Our advertising budget in slack times runs about three per cent of total sales; in good times, about two per cent.

6. *Prompt Attention to Customer Complaints*—A customer complaint should be the most important business at hand at the time. We never put it off to take care of it in due time. The customer has a legitimate reason for complaining and it's our responsibility to see that he is satisfied immediately. A quick adjustment of a complaint retains customer confidence. It is just another expression of the kind of dependability he likes.

The foregoing resumé of what we do to promote our motor shop may sound like a lot of work and expense. But, when all considerations are studied, it's not such a hard job.

Once the system is instituted and running smoothly, it revolves itself into a simple method of customer contact that pays dividends in more satisfied customers and more profits. After all, it is nothing more than doing business with business men in a business-like manner.



RESERVE STOCKS *of wire and materials reflect the ability of the shop to quickly care for a customer's emergency needs.*

MODERN EQUIPMENT *is the foundation of efficient shop operation. This latest type air-operated coil spreader helps reduce unit costs.*

BUDGET YOUR BUSINESS

It is not hard to set up a guiding budget for an electrical contracting business. It can be started any month and it goes to work for you immediately. Here is a simple method for organizing an effective budget control to begin this month.

By Arthur Roberts

TO make satisfactory profits, you must keep overhead at a safe ratio to sales. This involves the planning of forthcoming operations. After the money is spent, it is too late to effect savings, therefore, a budget is essential to profitable results. Our experience upon the accounts of electrical contractors shows that less than 10 per cent use budgets and that is one big reason why so many in this industry have overhead-aches.

Budgetary control, which is just another form of estimating, keeps business, on the whole, going forward. No business stands still. It forges ahead or back-slides. Certain years may show limited profits but over the span of years, the trend of a successful enterprise, large or small, is upward. Unless the electrical contractor makes a practise of budgeting business operations, he cannot assure himself profits.

Many contractors fail to budget because they think it is an involved procedure. As with all forms of accounting, budgeting follows certain fundamentals and the build-up thereon may be simplified or involved. A budget is a pre-determined compilation of estimated figures covering operations for a forthcoming period. It may begin with any month, cover any length of time period. Business can be "budgetized".

Here's an Example

Let's make up a budget for "Simpson and Johnson, electrical contractors," covering 1941. We will give the fundamentals of budgetary preparation in simple outline so that it can be easily understood and utilized by all, regardless of the size of the establishment. Budget preparation operates in reverse. First, we consider expenses for the past three years. It has been found that overhead averages up about the same from year to year in this industry, so by taking the average for the past three years, we get a safe figure to consider for a forthcoming year.

The Simpson and Johnson books show that the overhead for the past three years averaged $72,000. Sales for the same period averaged $224,000 per year. Gross margins averaged $67,200, or 30 per cent of sales.

Right here is one advantage of studying past performance for the purpose of preparing a budget. Simpson and Johnson's average yearly gross margin was $4,800 less than they needed to meet their $72,000 overhead expenses. So, they have been losing $4,800 yearly or about two per cent on average sales. This loss indicates that, in order to get volume, this firm has been cutting prices too drastically, a chronic condition in the electrical contracting field, and one, which a budget will help correct. As long as the overhead expense is kept to 30 per cent, the other elements of sales, namely the cost of sales and net profit, will take care of themselves. Keep overhead always in sharp focus. A budget, broken down into monthly estimates for monthly check-over with actual results, enables you to do this easily.

The weakness in the Simpson and Johnson organization is insufficient margin, not enough to cover overhead and an adequate profit. The 30 per cent gross margin fell two per cent short of covering expenses so that the firm could at least break even. To correct this deficiency, we set up the 1941 budget on the basis of a 35 per cent gross margin instead of 30 per cent.

Next we budget net profit for 1941. An analysis of the figures in this industry shows that 5 per cent net profit is a conservative estimate and budgets should always be conservative. Of course, the proprietor or executives should include reasonable salaries in overhead. Some contractors overlook their own compensation. But this is poor business management. You are entitled to a reasonable salary for your services plus a net profit, otherwise, you may as well be working for somebody else and by-pass all the headaches.

The budget build-up now stands:

Estimated gross margin or gross profit	35%
Estimated net profit	5%
Average yearly expense—$72,000	30%

If $72,000 is 30 per cent, one per cent is 1/30 of $72,000, or $2,400, and 100 per cent is 100 times $2,400 or $240,000. This $240,000 is the estimated sales volume for 1941, which will cover overhead expense and net 5 per cent profit.

Insuring a Profit

Next, we prepare the master budget for Simpson and Johnson as follows:

Net profit (5 per cent of $240,000 sales)	$12,000
Overhead (30 per cent of $240,000 sales)	72,000
Gross margin (35 per cent of $240,000 sales)	$84,000
Cost of sales (labor, materials, job expense)	156,000
Budgeted sales volume	$240,000

Since it has been determined by an analysis of figures for the past three years that 35 per cent is adequate for overhead and a conservative net profit, obviously, the difference of 65 per cent will be the cost of sales, in this case, $156,000. This figure should guide the budget user in making purchases of materials, labor and checking costs during 1941.

Some contractors prepare a separate "Cost of Sales Budget", based upon the sales figure in the master budget, using ratio estimates between labor, materials and job expense that have been found most profitable in the past or the ratios they hope to attain for a coming period. This ratio will vary with the business and it is a topic in itself so we will not

SIMPSON AND JOHNSON . . . 1941 BUDGET

MONTHS	SALES				EXPENSES			MARGIN %		NET PROFIT %	
	Average past 3 years	% of average	Estimated 1941	Actual 1941	Estimated 1941	Actual 1941	% of sales	Estimated 1941	Actual 1941	Estimated 1941	Actual 1941
January	$8,000	3.5	$8,400		$4,400			35%		5%	
February	7,200	3.2	7,680		4,400						
March	11,200	5.0	12,000		5,200						
April	13,600	6.1	14,640		5,600						
May	20,800	9.5	22,800		6,000						
June	24,000	10.6	25,440		6,400						
July	22,400	10.0	24,000		6,800						
August	25,600	11.4	27,360		6,800						
September	26,000	11.5	27,600		6,400						
October	28,800	13.0	31,200		8,000						
November	21,200	9.2	22,080		6,400						
December	15,200	7.0	16,800		5,600						
Total	$224,000	100.0%	$240,000		$72,000 30%			35%		5%	

SIMPSON AND JOHNSON'S SALES for the past 3 years averaged $224,000. January sales for the same 3 years averaged $8,000, so the monthly average percentage for January sales is 3.5, and under normal conditions, this firm may expect this percentage in 1941. Other monthly sales are figured in the same way to get monthly percentages to yearly sales. In arriving at monthly estimates for 1941, we multiply the planned sales for the year—$240,000—by the monthly percentages computed from monthly sales averages in the past.

For example, to get budgeted sales for January, multiply $240,000 by 3.5 per cent, which gives $8,400. Do likewise for each month to build up the column on estimated sales for 1941. In computing figures for the columns covering expense, margin and profit percentages, figure on sales. Actual percentages should be compared monthly with estimated percentages. Some budget users use red for estimated and black for actual figures. Monthly expenses are pro-rated according to averages for previous years.

go into it here except to point out that labor sales in themselves are seldom profitable. You must sell a satisfactory ratio of equipment and materials.

From the master budget, we prepare the final budget. Columns may be provided showing actual sales by departments or products, such as lighting, motors, wiring — industrial, commercial, household installations. In this way, the budget user can determine whether definite departments or classes of work are holding their own in sales or dropping behind as compared with ratios of former years. If desired, you may prepare separate budgets for departmental operations, using the final budget as a control.

The specimen budget shows that some monthly expense percentages are higher than the average of 30 per cent, which was figured as the ratio of expenses to sales volume for the entire year. This happens in all businesses because fixed expense, such as rent and insurance cannot be cut in low-volume months. If Simpson and Johnson keep within budgetary limits, they will average up safely for the year even though ratios of expenses to sales are high in some months.

Safe Guides

It is not necessary to adhere strictly to past averages in making budgetary estimates, but experience shows that they are pretty safe guides to follow in charting the future. Some budget users take the figures for the previous year on sales, cost of sales, overhead expense and build a budget for the forthcoming year on this foundation but we recommend the preceding three year period. Budget estimates should be checked monthly against actual results.

This close attention to the details of a business is worth while even though large discrepancies are not disclosed. A budget sets one thinking about expenses and other vitals of business, which, in itself, is salutary. The few electrical contractors, who use budgets to keep the eagle eye on overhead and other elements of sales, contend that these profit-prophets disclose many shortcomings and eliminate expense leaks. Furthermore, they report that it isn't difficult to keep within budgetary figures if one checks against them regularly.

Sometimes, the sales volume is geared higher than previous years' sales have averaged. In time of great business stimulation, such as we are now experiencing, with defense programs being accelerated, it is not bad judgment to figure high on sales. Contractors who gear their budgeted volume high may not always make their goals. Sometimes, they are greatly surprised if they hit budgeted estimates. With them it is the old story, "Hitch your wagon to a star". They purposely make the figure high to stimulate their organizations to maximum effort. If you set up a substantial sales quota and try to make it, you will more than likely fare better than if you just amble along month after month hoping to get somewhere.

Easy to Operate

The electrical contractor who assumes that a budget is too complicated a device for his business, should remember that many concerns that buy and sell hundreds of different items in many different sizes and at many different prices are utilizing budgetary control successfully, hence, it is a practical procedure for large or small contractors. A budget puts a straight-jacket on overhead so that expenses do not run wild. However, it does not pay to cut expenses too drastically in a budget and then try to live up to the estimate. This may do more harm than good. You must spend money to make money and often curtailing outlays for business betterment, such as advertising and truck modernization, minimizes profits.

The primary purpose of a budget is to chart the course of future operations so that the business does not flounder around aimlessly or crack up against the rocks of keen competition, much as a ship needs a compass to guide it safely to port.

You may start to budget operations with any month in 1941, then next year compile estimates for all of 1942. Do not put off budgeting until next year. Begin with the first of next month and you'll find that profits will rise.

PREPARATION DEPARTMENT *in this 500 by 50 foot cannery building has 35 foot-candles over trimming tables and 20 foot-candles over packing tables.*

Fluorescent Lighting in a Cannery

This Hawaiian cannery steps up lighting to 35 foot-candles with two lamp RLM industrial reflectors

BY furnishing illumination of unchanging color day and night fluorescent lighting is proving a boon to the packers and trimmers in the Hawaiian Pineapple Cannery in Honolulu. During the peak season, the painstaking and skilled work of turning out a product of superior quality takes a total of approximately 5,000 men and women, on three shifts, in the preparation department.

Among the tasks performed is the grading of pineapple slices of special cut, to secure uniformity of color and texture and perfection in general. Another important task is the careful trimming of fruit to remove any bits of shell that may remain after the outer covering of the pineapple has been removed.

Several months ago, studies of fluorescent lighting were made under the guidance of Harry D. Jefferson, chief electrician of the plant. Tests were made to determine scientifically the best color of light for the work and the best location for the fixtures. One of the major problems was to keep radiant heat to a minimum. After numerous lighting experiments under actual working conditions, a new lighting system composed of 576 RLM two lamp fluorescent units was installed in the preparation department, syruping department and double seaming department.

The fixtures were arranged in lines 11-ft. 7-in. above the floor, with 6-in. of space between the ends of the units. Over the trimming tables these lines are 10 feet apart, over the packing tables a distance of 20 feet separates the lines, as packing operators, in contrast with the trimmers, work on one side of their tables only. Among the advantages that have proved out for the new lighting installation are:

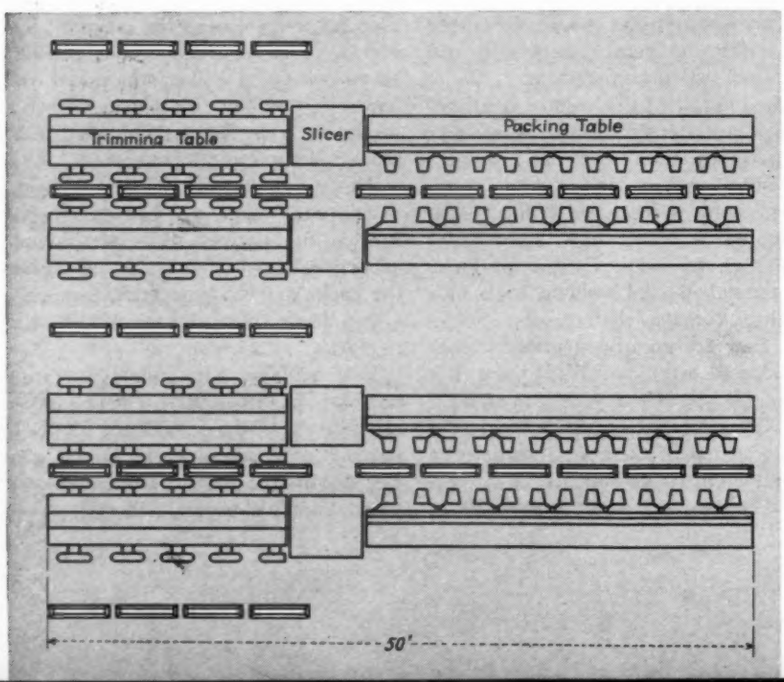
1. Good blending with daylight. The lighting system is used day and night and it is important that color perception be the same on all shifts.

2. Specular reflection from the previous incandescent lighting installation, reflected from shining cans and stainless steel tabletops, resulted in severe eyestrain. With the fluorescent units, high brightness sources have been eliminated and consequently eyestrain and headaches have been reduced to a minimum.

3. The low level of radiant heat from the fluorescent lighting equipment permitted mounting of the fixtures lower than the previous incandescent lighting system with a consequent increase in efficiency.

The lighting over the packing tables has been increased from 6 foot-candles produced by the old system to 20 foot-candles with the fluorescent light, based on a maintenance factor of 85 per cent. The intensity has been raised over the cannery trimming table from the previous 6 foot-candles to 35 foot-candles with the fluorescent installation.

In all, 576 fluorescent units have replaced 245 glass steel diffusers of 500-watts. This has cut the kilowatt load from 122.5 for the incandescent to 57.6 for the fluorescent. Of this 57.6 kilowatts, only 43 per cent or 33 kw is radiated heat. The balance of the heat is dissipated by convection or conduction to the surrounding air and dissipated upward through the ventilation monitor. With the previous incandescent system, there was about 95.5 kw of radiated heat.



PARTIAL LAYOUT *plan showing the arrangement and spacing of the fluorescent lighting units. The mounting is arranged to throw the light from behind the operator's station.*

Leverage that moves Cutler-Hammer MULTI-BREAKERS for you

DURING the year 1941, Cutler-Hammer is running an even more intensive National Advertising Campaign on the famed Cutler-Hammer Multi-Breaker. An intensive advertising campaign concentrating even more heavily and more extensively on the home owners and home builders that make up your market for electrical equipment.

Repeated advertising insertions in magazines proved to be the most widely read by prospective home builders and modernizers...More space...More interest aroused...More real prospects...That's the 1941 leverage that will move C-H Multi-Breaker business your way—if you are ready for it. Cutler-Hammer leadership proved out and paid out in 1940. It will prove out and pay out even better for electrical equipment men in 1941. Are you going to let it work for you? CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers*, 1306 St. Paul Ave., Milwaukee, Wisconsin.

CUTLER-HAMMER
MULTI-BREAKER
C-H

PUSH THE "LEVERAGE" LINE

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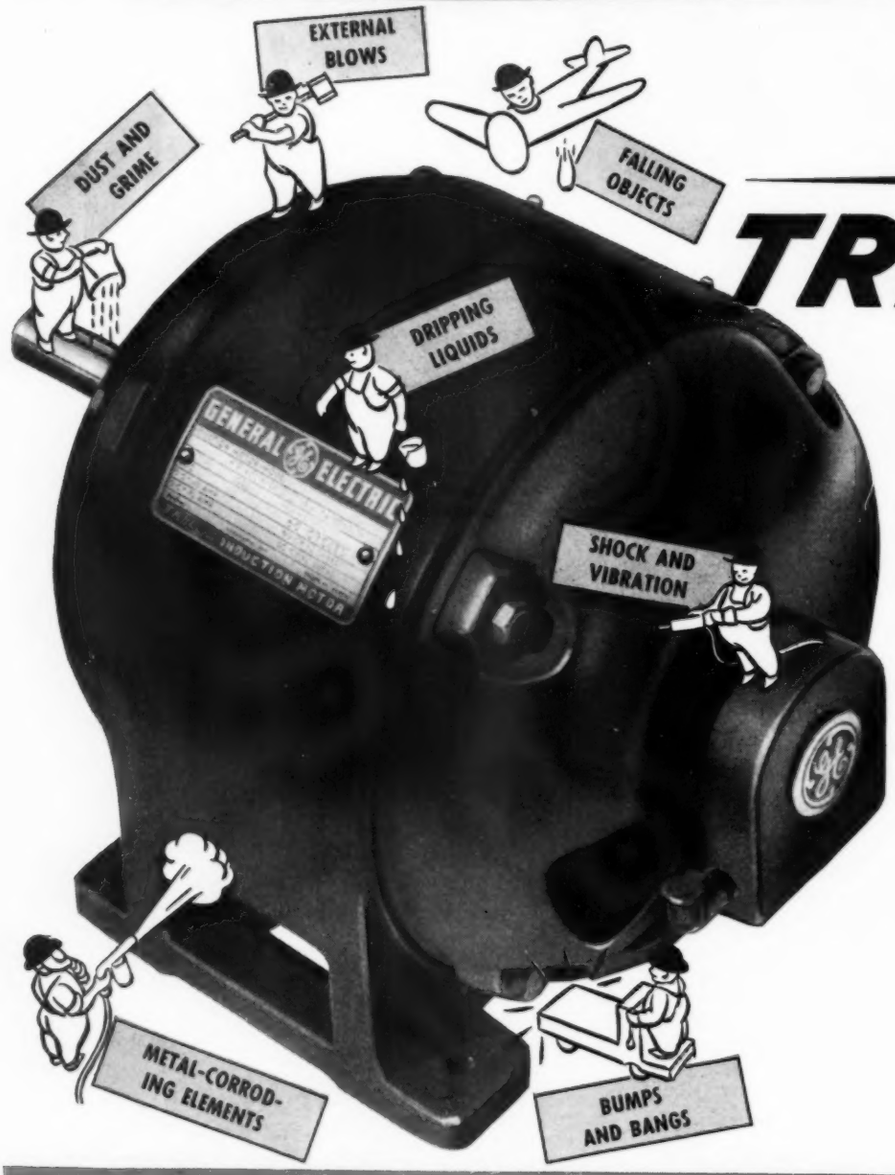
Cutler-Hammer, Inc.

THE MOTOR YOU ASKED FOR



NEW TRI/CLAD MOTOR

No other standard motor, we believe, has ever met the general-purpose requirements of industry with so well-balanced a combination of performance characteristics, convenience features, and provisions for protection. Integral-hp sizes up to 20 hp (at 3600 rpm), open or splashproof, are now available. Capacitor-motors up to 5 hp (at 3600 rpm) can also be furnished.

BUILT FOR PROTECTION FIRST...TO LAST

IS STRONG ON PROTECTION

Extra Protection
AGAINST PHYSICAL DAMAGE

A truly modern motor, you told us, must be able to withstand accidental blows, flying chips, dripping liquids, and occasional bumps in moving or mounting. That's how we built the Tri-Clad motor!

We made the frame and end shields of cast iron; used channel and rib sections to give ample strength where needed, without increasing the weight; cast the feet integrally with the frame to make them sturdy and rigid. We completely enclosed the upper portion and carefully baffled all ventilating openings to protect vital motor parts. We provided the bearings with cast-iron housings and made them dust tight. And the finishing touch—we give the motor a tough coat of paint that protects the metal parts against rust and corrosion.

The Tri-Clad motor is fully protected against the accidental ill-treatment some motors encounter all the time, and which *all* motors encounter some of the time. As a safeguard against production interruptions, as a prime factor in lowering costs, as an extra increment of value on machines you build, you'll find that this new motor means extra profit protection, too.

Be sure your next induction motors are Tri-Clad. General Electric, Schenectady, N. Y.

Extra Protection
AGAINST ELECTRICAL BREAKDOWN
New stator windings of Formex wire give extra protection internally against moisture, oil, abrasion, and heat aging. New synthetic impregnating and protecting varnishes make a rigid unit with a hard finish.

Extra Protection
AGAINST OPERATING WEAR AND TEAR
Sleeve bearings of new design have longer life and greater load capacity. The one-piece, cast-aluminum rotor winding, with fans cast integrally, is practically indestructible.

GENERAL ELECTRIC

Earl Whitehorne, Editor

What Can Be Done

America is beginning to realize that this Defense Emergency is serious business. First it was just Washington talking. But when Knudsen and other business leaders got into it so earnestly, it began to sound different. And now we see that if Britain falls, we stand alone in a hostile world, rich and open to attack in many ways.

There is no longer any question that every man of us must do what he can to help America get ready. And that right now, means to help our factories produce more munitions of war. And we electrical men fortunately can do that. We can show the management of every factory in every town ways to increase capacity, speed production, improve working conditions or cut costs in its plant. There is always something that can be improved in the lighting, motorization, control, ventilation, material handling or in the electrical system somewhere.

Here lies our job—each in his own town. But it is not enough for us just to fill orders and answers calls. We must go to these factories and show them what can be done.

Conduit Shortage?

Talk in Washington about a zinc shortage has alarmed many conduit buyers. Some of them have committed the old folly of ordering more galvanized pipe than they need—"just in case." And this upsets everybody's calculations and makes the condition worse.

There is no real zinc shortage. Our mines are full of ore. But smelters have been overloaded with the abnormal demand of the war program and deliveries are late. More smelter capacity is coming and will take care of that.

There is no shortage of conduit either, though heavy abnormal demands have slowed down deliveries somewhat. But fortunately black enameled pipe can be substituted where necessary on most any job, if the reason is explained. And the price on popular sizes is so near that of galvanized conduit that contracts will be little affected.

It is a temporary situation. When we're over the hump, zinc coated conduit will be available to all. And the trend toward eventual standardization of galvanized pipe and fittings will continue until some happy day we will not have duplicate stocks to carry—black and white.

Meanwhile there is nothing to worry about. The thing to do is to accept black pipe when you have to and be glad. Accumulate what stock you can but don't pyramid orders.

These New Values

Changes in electrical wiring and equipment open up many opportunities to sell more safety switches. At distribution centers for feeder control, for new sub-feeders added to old wiring, to disconnect motor starters on new replacement work, ahead of heavy duty equipment such as ranges, water heaters, industrial heating units, welders—there and at many other points they will render valuable service.

It is all pretty much a matter of the mental attitude of the contractor himself. He can go along expecting to install just the regular stuff in the old way. Or he can open his eyes to the new values of step and minute saving in industrial production. When he does, a whole new market opens up to him.

Personnel Sabotage

Fat government pay checks are teasing away experienced estimators, superintendents and engineers from long established organizations. General contractors, handling negotiated fixed fee contracts, are hiring others. And the end is not yet in sight.

There is absolutely no justification for such tactics in the name of national emergency. This stripping firms of key men at the time when their full organized strength is needed most, is a dangerously short-sighted policy. The services of these men are always available to government and defense industry through normal business channels. They are hired to take over work that would be handled far more efficiently and quickly by a simple order to a competent electrical contracting firm.

–And Order Comes

New York City now requires the conspicuous labeling of fluorescent fixtures. Boston has an approved list. So have other cities. Standards are growing stronger. Control is evolving. And gradually order comes out of confusion.

We have seen it so often in the electrical industry—A new idea—a new appliance is welcomed by the public—becomes a fad. Everybody buys and everybody sells and everything goes haywire with enthusiasm. Then comes a snarl of mistakes, misunderstandings and disappointment.

Slowly we calm down and put the fad under discipline. And pretty soon we have a stable market for dependable merchandise. Headaches and pocket losses mark the process but in the end the industry offers one more good service.

More Instrument Work

Factory management, absorbed in production problems, is going to suffer a lot of grief this year unless the use of instruments increases. And it will. For the prevention of breakdowns becomes steadily more vital.

Recording instruments chart department performance and tell a vivid story. They locate overloaded machines. They indicate weaknesses in the wiring. Indicating meters feel the pulse of the electrical nerve sys-

tem at any point and give warning. Risks can be avoided. Repairs can be made.

But first you must have an adequate instrument equipment. Then you must organize it into habitual use. There is no form of insurance more profitable.

Price Only?

It is a curious thing. A man will buy a suit of clothes, golf clubs, an automobile or a house and consider a lot of angles. What he will pay depends not only on price, but what he gets—What kind of a suit? Whose make of golf clubs? Which car? How big a house? The price is relative.

But many electrical contractors, when they talk to a prospective customer, act as though a wiring job involves nothing but price. How about quality of materials? Skill of workmen? Supervision? Completeness? Responsibility? Benefits from a well designed system? Are these worth nothing?

To Sell Rewiring

The power companies wanted small diameter wire. They fought for it and finally got it approved under the Code. We are glad they did. We are disappointed, however, that they are doing so little to encourage its use locally.

There is an idea to sell here before much progress will be made. It is the idea of increasing the capacity of the wiring systems of large buildings by the substitution of the wire of smaller cross section. If it was worth getting, why is it not worth advertising and promoting? It is as vital to increasing the power companies' load as the sale of more appliances to homes. Yet most of them are doing nothing to forward this purpose.

The contractor should work hard to get this great re-wiring movement going. One of the best things he can do is to sell his local power company on promoting it.

Good Work Vital Now

The importance of good workmanship and complete responsibility should be stressed by electrical contractors and motor shop men as they talk with industrial management now. For 24-hour production looms ahead as everybody's volume builds up and breakdowns will be a lot more critical.

A thorough checkup of the entire electrical system, should be urged for every factory that contemplates working more shifts. Every added shift makes a breakdown more serious, more difficult to handle and more expensive.

Back Talk

Labor Shortage?

To the Editor—"Your article in January in regards to shortage of journeymen, there must be something spoofy. There are journeymen reporting here every day wanting work. They will do anything at almost any price to get a job. We are 37 miles from Portland, Oregon, on a 3-lane paved highway, and they come out here right along looking for work."

E. L. Houck
McMinnville, Oregon

The reports of labor shortage given in our article on Defense Business are accurate. Of course, some localities may still have an excess until labor flows to the spots where it is needed. Also, there will also always be some men idle because local employers do not want these individuals for various reasons. But the shortage exists where reported and unfortunately is apparently increasing.

That Better Name

To the Editor—"I have noticed several suggestions for a new name for 3-way switches. I have found in my 20 years or more of house wiring that the public express the 3-way switches in several ways and seem to know what they want. They do not express it as we electricians do, some or most of them say '2-way'. Now I suggest the expression 'two station' switches, and if any more points of control are required that will be '3-station' or '4-station'. I think the public will understand better and express it in a way all can understand."

H. K. Smith
Electrical Contractor
Mantua, Ohio

It's an idea Mr. Smith—clearly better than the confusing practice of calling a switch that works two ways, a "3-way." We still like pretty well the term suggested by the man in Mexico City, who told us that down there they call them "stairway switches", just a plain description of their principal use. Let's have some more!

Fluorescent Light—Perhaps

To the Editor—"Your opening editorial in January infers that the fluorescent lamp provides better, cooler, and cheaper light for night operations of industrial plants. While it is true that these objectives can be obtained by the use of the fluorescent light source, it is not true that their attainment automatically follows the use of that light source. This is a matter of proper design and the proper balancing of the various factors that enter into a correct lighting installation.

"Every sound illuminating engineer understands that the provision of adequate lighting is more often than not the result of careful study and careful planning, not reliance on rule-of-thumb methods or incomplete information. The fluorescent lamp, the incandescent lamp, the mercury vapor lamp, all have their place, and I think it is a mistake to indicate that the benefits of good lighting are only attainable through the selection of one of these available light sources."

Howard M. Sharp
Buffalo Niagara and Eastern Power Corp.

Quite right, Mr. Sharp. We agree with you. Our statement in the January editorial hung on the preceding question—"And what new tools have we to use this year to be of greater help?" We were talking of helping industry with the Defense Program. We did not mean to intimate that fluorescent lighting is a panacea.

In fact, fluorescent units should only be sold as lighting, as we have often pointed out, not as just something new. It involves sound engineering and intelligent installation by a responsible electrical contractor or plant electrical engineer.

More for the Small Man

To the Editor—"I look forward every month to *Electrical Contracting*. My only criticism, it doesn't have enough in it. I usually can read it thru in fifteen minutes or so. It seems to me you could insert more to interest the small contractor, the curbstoner like myself."

Richard McGiffin
Canton, Ohio

Well, that is a frank and friendly challenge, McGiffin. Let's talk it over. We have a great many highly valued readers who are small contractors. The problem of how to serve them best—what to give them to read—has had much of our thought. And here's how it looks to us.

The small contractor wires houses mostly and stores and shops—small jobs. The planning of these jobs is pretty simple, the materials, equipment and tools used are pretty much alike. We don't believe it will interest him or help him much to describe and picture jobs of this kind.

So we run feature articles on larger jobs that have some distinctive feature, that should interest him and often suggest methods that he can adapt to smaller work. We describe many lighting installations. Certainly these are valuable to him. We publish short, simple engineering articles on fluorescent lamps or something. This is valuable information for him. We run lists of what to remember in wiring a foundry or metal shop. He can use this knowledge. We run general articles about conditions or trends in electrical construction—his trade, to keep him up to date. Among the features, each month there is always something of value to the small man, we believe.

But that is only part of it. The bulk of this paper lies in its many practical departments. They bring you ideas from the experience of other contractors, large and small, on "Wiring Methods" and "Motor Shop" equipment. You can use some of them. There are ideas you can use in "Better Lighting.". There are man-hour figures in the "Estimating" Department to help you on various kinds of work. There are "Questions on the Code," answered by an authority. Surely this is valuable. There is the "Equipment News," a review of new products you may want to buy. Then there are the advertising pages, in themselves a source of vital news and suggestion to the small contractor as much as any one else.

Now, McGiffin, unless you use a soft rubber watch that stretches, I don't believe you can read all this in fifteen minutes. Yet this is what we put in every issue for the small contractor. We plan it that way. And what's more we go and get it for you. For it doesn't come in to us through the mail. Our field editors call on contractors and visit their jobs to get these ideas for you, and frankly I think they are entitled to more than fifteen minutes of your time when each issue reaches you. How about it?

We have written thus at length because we want you to understand that we are trying thoughtfully to make this paper valuable to the small contractor—to you. We want your suggestions. Think it over and write again. What shall we do to make Electrical Contracting more interesting to you?

WIRING Methods

REMODELING TOOLS

On sampling the tool vaults of several electrical contractors who specialize in remodeling, we came away with the following list of essential power tools that should be provided to augment the mechanics tool bag—

1. Electric drills—several and they must be kept in first class condition.
2. Electric hammer—at least two for ordinary service and at least one big fellow.
3. Electric hand saw—even if your men are contortionists and cabinet makers they can't do the tricks this will do—and fast.
4. Plaster cutter—a double wheeled cutter that routs a neat slot about one inch wide in plaster walls and ceilings.
5. Pipe machine—preferably a small vise stand type or other easily portable machine.

These are only the "must" items. Each had other pet devices. One thing is certain—the fellows who rely on cut prices, elbow grease and hand tools are finding kilowatts tough competition. Remodeling is a machine job.

DESIGNED FOR EXPANSION

When the Garden Electric Co., Inc., Elizabeth, N. J., designed this incoming high tension cubicle for the power service to a New Jersey manufacturing plant, future expansion was considered.

The primary service is 4150-volts three phase, four-wire and the cubicle contains a 600 ampere, 15-kv. oil circuit breaker together with the necessary primary disconnect switches. Metering is on the secondary side of the transformers.

This cubicle is so designed that a second primary unit can be installed adjacent to it in case of future plant expansion, at which time primary metering will be used. The present unit contains four angle iron brackets mounted to the front panel of the cubicle and the breaker trip transformer support. The brackets are drilled for mounting the potential and current transformers when primary metering is installed. The cubicle is enclosed by a hinged side door which can be removed when new unit is added to system.

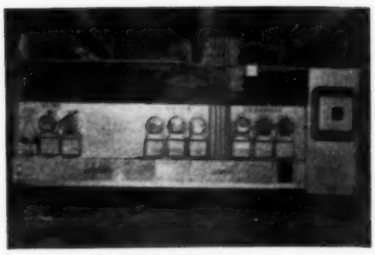
***MOUNTING BRACKETS** for future primary metering transformers are a part of the original equipment of this incoming primary oil circuit breaker cubicle.*

DISTRIBUTION TROUGHS

In a group of new stores in Moorhead, Minnesota, Dudrey Inc., electrical contractors, designed an attractive and efficient distribution arrangement for the metered circuits.

Passing through a fused main service switch, the service feeds a group of meters. Each store or occupancy has a set of three meters for light, heat and signs.

A 12 gage metal wiring trough extends from the service switch under the meters, enclosing the main feeders and the meter wiring. Directly under each meter the metal face of the wiring trough is cut out to receive a circuit breaker.



***WIRING TROUGH** does double duty as wiring enclosure and distribution panel. Circuit breaker units, as at right, are installed under each meter.*

The accompanying photograph illustrates the method, only one circuit breaker is shown installed. Feeder circuits are extended from knockouts in the top of the wiring gutter.

CONCEALED H. T. LIGHTING TRANSFORMER

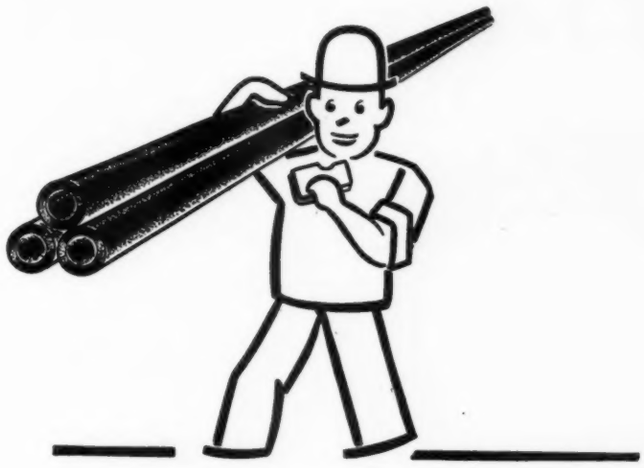
In a recent commercial building installation, for which Lord Electric Co., New York City, was the contractor, high voltage fluorescent lighting called Zeon was installed in the show cases on the main sales floor.

The tubing used in this type of lighting, which is somewhat similar to the familiar neon, is only 10 mm. in diameter and comes in long lengths bent to conform to the lines of the showcase. Since 5000 volts is necessary to operate this lighting, high voltage transformers were needed.

***DUMMY DRAWER** section in this showcase is removed to gain access to the high voltage transformer for the Zeon case lighting. Switches at the right control the case lights.*

To minimize the length of the high voltage circuit and the danger of unauthorized persons contacting it, the transformers were mounted as near to

WHEN YOU CAN CARRY CONDUIT AS EASILY AS THIS



there's less "TIME AND MATERIAL" *to carry, too*

The job of carrying heavy conduit to the trench can be a back-breaking part of any installation. And on "spread-out" outdoor jobs, it can be profit-breaking, too—unless you use Orangeburg Nocrete Conduit.

Although it's so strong that it needs no concrete encasement, Nocrete is relatively light in weight. A man can carry two or three times as much "footage" than is usually possible with metal pipe or other heavy conduits. The lengths are "handy", too.

Try Nocrete on your next "underground"—and you'll find that it not only provides permanent cable protection, but because it costs less, handles, assembles and installs easier and faster than *any* other conduit you have ever used, there will be extra profit in every foot for you.

There's *extra* profit
for *you* in every foot of

ORANGEBURG

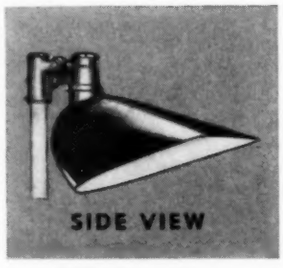
NOCRETE CONDUIT

Sales Agent — Distributors
GRAYBAR ELECTRIC CO., INC.
GENERAL ELECTRIC SUPPLY CORP.

MADE AT ORANGEBURG, NEW YORK BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY

ORANGEBURG *Standard* for installation *with* concrete encasement
Nocrete for installation *without* concrete encasement

—provides brilliant illumination for protective floodlighting of industrial properties; for parking spaces, athletic fields, gasoline service stations, and other large areas where a uniform, high intensity of illumination is desired.



SEAMLESS CONSTRUCTION

This floodlight is formed from one piece of metal, without seams of any kind. Not only have mechanical construction and design been improved, but the already high efficiency of the No. 90 has also been increased. With permanent porcelain enamel finish, it is weather-proof, rugged, ready to deliver efficient service for years to come.

The new No. 90 Floodlight is equipped with cast aluminum ventilated hood for pole or bracket mounting, and accommodates lamps of from 750 to 1500 watts. Available also for mercury or Bipost lamp operation. Catalog sheets on request.

GOODRICH INDUSTRIAL LIGHTING

The Goodrich line covers the complete range of industrial lighting equipment, including all RLM-approved fixtures, fluorescent fixtures, etc., as well as many exclusive designs. Literature is available on all Goodrich fixtures.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

WIRING Methods

[FROM PAGE 30]

the tubing as possible. And the best place turned out to be at the base of the showcases. The space behind the cases, from the showcase proper to the floor level, was utilized for a number of drawers to hold the merchandise. In each showcase, part of this space was used for the lighting transformers. A dummy drawer section was built to slide in this space and conceal the transformers. The transformers were installed in an approved steel enclosure at the base of these sections. Ample ventilation was provided.

The low voltage side of the transformers was connected to the 110-volt lighting circuits which terminated at these dummy drawer sections. Switches to control the showcase lighting were mounted on a panel adjacent to these sections.

TRANSFORMER PLACEMENT

To shorten the secondary and give better voltage close to the operations, here is a unique expedient for hanging distribution transformers from a bracket mounted on the side of the building. It was used by Puget Sound Pulp & Timber Co. at Bellingham, Wash.

The 2,400-volt primary from the company's substation in the yard comes underground to a riser on the outside wall of the building. The transformer is a 50-kva., 2,400 to 120/240 volts, mounted approximately 25 ft. above ground. The secondary runs down the outside of the wall in conduit and through the wall to a distribution center. Of like importance is the elimination of service wires across the railroad tracks and truck roadways in the yard.

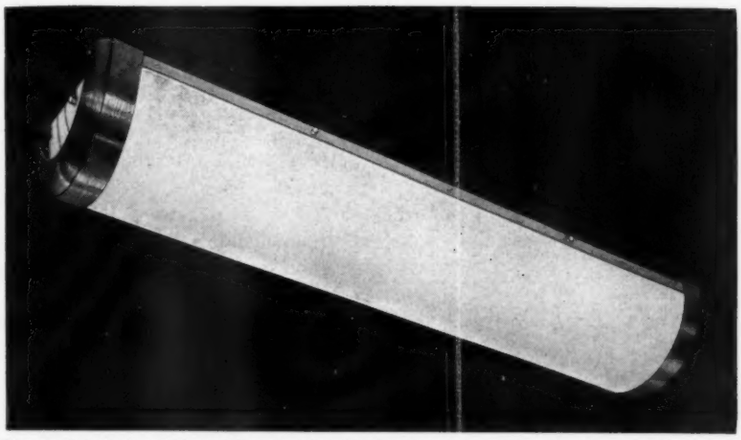
TRANSFORMER MOUNT—Shortens secondary run and avoids service wires across tracks and roadways.

FOR THE MAXIMUM IN CONSTRUCTION, INSTALLATION AND PERFORMANCE ADVANTAGES . . .

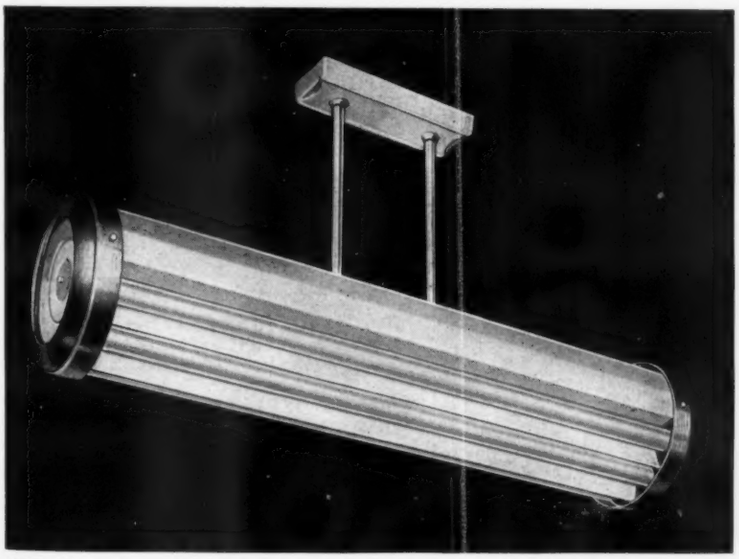
PERMAFLECTOR FLUORESCENT LUMINAIRES

. . . MAKE THEM

"No. 1" in '41!



No. CF-448 Series—Direct Illumination for Surface Mounting. For 4 lamps, 40 watts. Length lamps, 48". Length fixture, 50" depth 6-⅛"—width, 10-⅜". Delivered unwired and unequipped, or wired and equipped with ballasts, starting compensators, lampholders, starter sockets, and with or without plastic enclosure.



No. SF-648 Series—Direct-Indirect Illumination for Suspension Mounting. For 6 lamps, 40 watts. Length lamps, 48"—cover to ceiling, 25". Can be delivered unwired and unequipped, or completely wired with ballasts, starting compensators, lampholders, starter sockets, and with or without plastic enclosure.

In keeping with the quality, design, performance and manufacturing features that have always distinguished the Permaflector line of incandescent equipment, the Pittsburgh Reflector Company wishes to announce a line of fluorescent equipment, equally outstanding in its field . . . the new, distinctively styled PERMAFLECTOR FLUORESCENT LUMINAIRES . . . fixtures that offer many construction, performance and installation advantages to those who install or specify fluorescent equipment.

The complete group is especially built to provide illumination of the finest quality. A range of types and sizes . . . from two to six lamp units, flush or suspension mounted . . . provides just the unit you may need for a specific job. Numerous basic design features, such as individual reflectors for each lamp, decorative end plates of bronze or aluminum, plastic enclosures, etc., make these luminaires all the more efficient and attractive.

Space limits a complete description, but data covering types and designs, materials and finishes, installation, wiring, auxiliaries, and so forth, can be found in Advance Notice No. 17 . . . a supplement to Catalog No. 40. *Write for it!* Fill in the handy coupon attached, and mail it today. Make the complete Pittsburgh line your "No. 1" in '41!

GET YOUR COPY TODAY

Advance Notice No. 17 . . . a bulletin filled with pertinent information on the Permaflector Fluorescent Luminaire line. Costs, wiring specifications, sizes, finishes, everything.

Write for your copy at once — fill in the coupon at right!

Pittsburgh Permaflector

THE PITTSBURGH REFLECTOR COMPANY
Oliver Bldg., Pittsburgh, Penna.

Gentlemen: E.C.-3-41

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PITTSBURGH REFLECTOR CO.

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Do You Pay Over 87½¢ for Top Quality 500m CM Solderless Lugs?

If So, Save Money—By Specifying Sherman

The Famous Sherman SO Line of Lugs at *New Low Prices*

- Hexagon Head Screws
- No special tools needed
- No Loose Parts
- Pure Copper—Highest Conductivity
- Extra Thread Plate for strength
- Floating Pressure Pad Attached to Screw
- Serrated Gripping Surfaces
- Five Sizes Only—Handle complete range of wire sizes from 14 to 500m CM
- Approved by Underwriters Laboratories

Our volume of sales on these increasingly popular Solderless Lugs has increased to the point where our manufacturing costs have been reduced.

We are pleased to pass this saving on to our customers, in NEW and LOWER PRICES, so that now you can have today's best Solderless Lug at but fractional cost over the cheapest lugs on the market.

Compare this SO Type Lug with competitive makes. Note its strength, rigidity, and contact surface. Only one-third as heavy, but *twice* as strong as cast lugs.

Investigate Sherman! See for yourself how you can now have QUALITY Solderless Lugs at competitive prices.

Write **For new Solderless Lug Bulletin No. 15, which gives descriptions, specifications and prices. It's FREE. Ask your jobber to show you this SO Type Lug.**

H. B. SHERMAN MANUFACTURING CO.
BATTLE CREEK, MICHIGAN

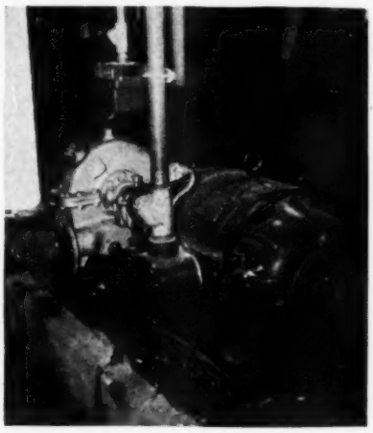
Wiring Methods

[FROM PAGE 32]

GROUNDING EXPLOSION PROOF EQUIPMENT

The importance of securely grounding all explosion proof electrical equipment and the fool-proof methods used to accomplish this are illustrated in the photograph below. This was taken in a recent oil cracking plant installation made by the M. W. Kellogg Co., New York, oil refinery contractors and engineers.

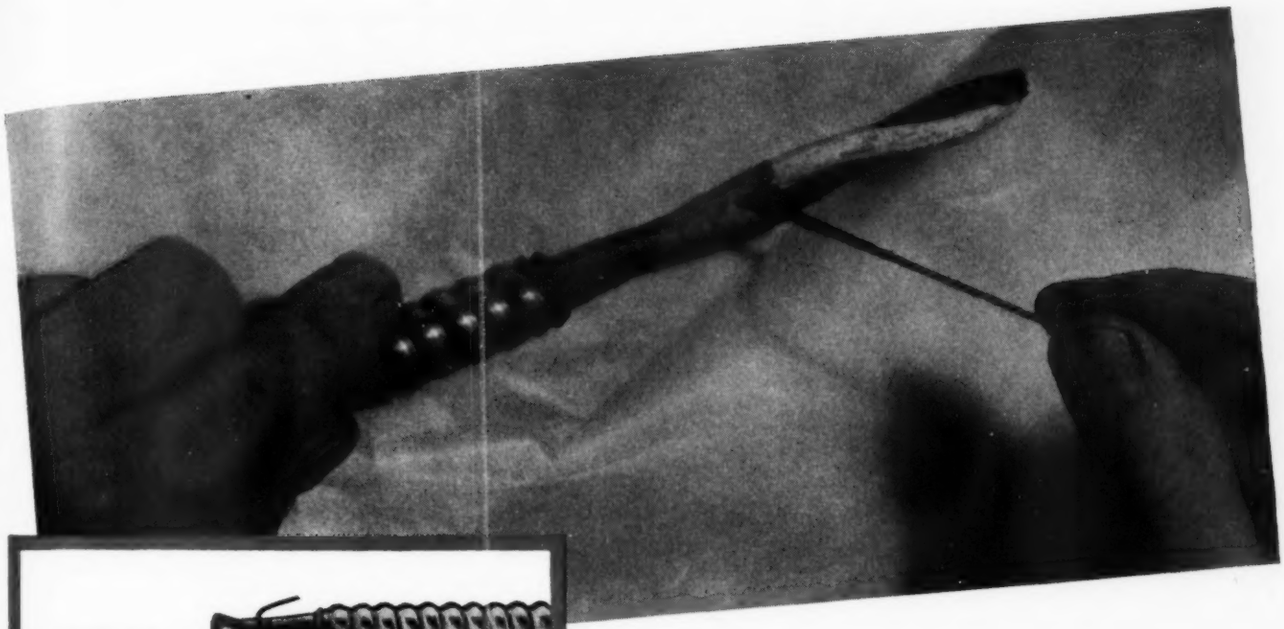
The building contains a number of explosion proof motors driving a variety of pumps. Remote control buttons are mounted on a bracket at the motor location. Each conduit line is equipped with an explosion proof sealing fitting wherever it enters a switch or terminal box. Tight connections between the conduit and fittings are not considered substantial by this company for a continuous ground. In addition, bare copper conductors are used as ground jumpers between the conduit, motor frame and the underfloor ground network.



***BONDING JUMPERS** provide extra security in the grounding of explosion proof electrical equipment.*

The conduit bond is bolted to a connection strap mounted on the motor frame. To this strap is also connected the underfloor ground conductor which in turn is connected, with other equipment grounds, to the outdoor underground network by a second bonding strap on the inside wall of the building. The ground network is buried in the earth and terminates in several points at vertically driven ground rods.

These bonding jumpers at the electrical equipment are an extra precaution against a break in ground continuity which, in some extreme cases, occurs due to the loosening of conduit and fitting joints by vibration or accident.



TYPE AC

The standard type of Armored Cable, with braided conductors and flexible steel armor.

ARMORED THERMOCABLE

For control circuits on heating systems, air conditioning apparatus, etc. Sizes 16 and 18, usually three conductors under one covering, but may be made with any desired number of conductors.

TYPE ACL

Lead covered conductors. For connections to exterior electric signs and floodlights and for use in damp places indoors. Hazard ACL has protective paper sheath between the lead and steel, which cushions and protects the lead.

TYPE CA

Flexible Lamp Cord, Hazacode rubber insulation, each conductor braided and twisted, covered with paper sheath and steel armor. For show window pendants or for pendants in dry places where subject to hard usage.

ARMORED GROUND WIRE

Usually No. 4, 6 or 8 AWG copper conductor without insulation, protected from mechanical injury by the flexible steel armor. For grounding wiring systems.

STOCKED BY ELECTRICAL JOBBERS

Install HAZARD ARMORED CABLES

These 5 types of Hazard Armored Cables make it easy for you to select the kind that exactly fills the bill for any purpose where Armored Cable may be used.

For complete information about Hazard Armored Cables, Building Wires, Service Entrance Cables, Underground Cables and Permex Thin Wall Insulation write for these booklets. Copies gladly sent on request.

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE CO.
Wilkes-Barre, Pa.
Offices in Principal Cities

HAZARD
A Complete Line of Insulated Wires & Cables

Better Lighting

CURES INADEQUATE WIRING

Much has been written to the effect that the fluorescent lamp permits higher levels of lighting with existing wiring, providing power factor correcting equipment is used at the lamp. A case in point is the Sales Promotion building at Nela Park, the Lamp headquarters of the General Electric Company.

This building was erected in 1913 and wired for 2 watts per square foot with ¾ inch conduit (imbedded in concrete) carrying one circuit per four outlets. The first relighting, done in 1923, improved this to 5 watts per square foot (300 watts per outlet) providing 15 to 20 foot-candles and this has been the maximum that could be pulled into these outlets.

***TIGHT WIRES** held the lighting in this office and others in the building to 15-20 foot-candles. Fluorescent lamps raised it to 50 foot-candles.*

The new fluorescent installation utilizes the same wiring, provides 50 foot-candles in service and consists of six four-lamp louvered units in offices approximately 14 feet long by 17 feet with a 12 foot ceiling. Both the white and daylight 40-watt (50-watts with ballast) lamps are employed. Hence, a four-lamp fixture requires 200 watts and with 6 units, the load per room is exactly the same as with the filament system, namely 1200 watts.

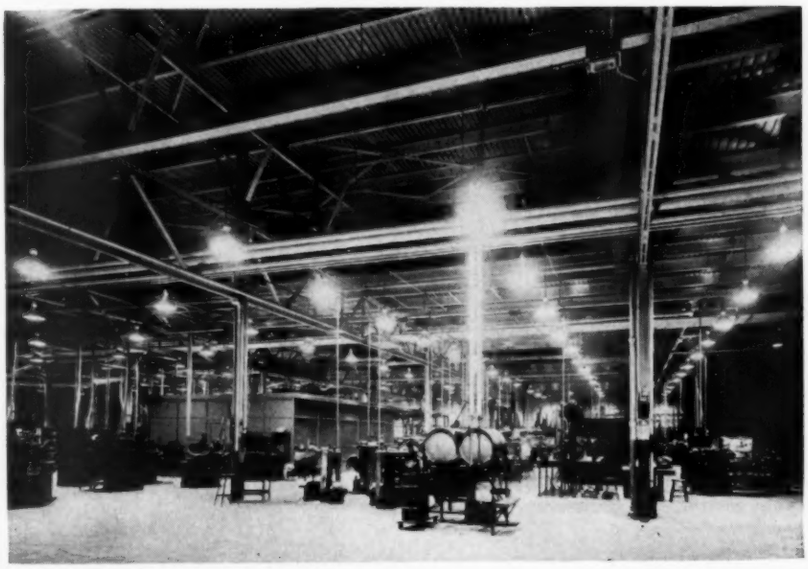
MODERN LIGHTING FOR A BAKERY

The New York Bakery located on Joseph Avenue, Rochester, New York has taken advantage of the pulling power of light to create an environment that has plenty of sales appeal.

The general lighting of 35 foot-candles is provided by six 500-watt Guth units and the counter lighting by six 200-watt Garcy downlights. These place 75 foot-candles on the counter tops where the actual purchase takes place.

The silhouette signs and the cash

***PASTRIES HIGHLIGHTED** by direct downlighting stand out in this modern bakery. Eye appeal of the shop is accentuated by the use of indirect general lighting, silhouette signs and concealed wall case lighting.*



***MERCURY INSTALLATION**—Twenty-five foot-candles are provided throughout the 40,000 square feet of floor space in the machine shop of the Carboloy Company, Detroit. Four-hundred-watt Type H mercury lamps in Ivanhoe equipment are employed. The units are mounted 15 feet above the work area and spaced 15 feet apart.*

DayBrite DOUBLES YOUR PROFIT POSSIBILITIES *in these 2 Ways*

The Electrical Contractor who centers his sales efforts on Day-Brite enjoys two big advantages over competition.

He is always in position to deliver the exact fluorescent lighting fixture that meets a particular lighting problem. Because, with Day-Brite, he has "The Complete Line of Fluorescent Lighting Fixtures"... the right fluorescent lighting unit for every lighting need.

And each fluorescent sale pays him both immediate and future profits, because Day-Brite quality leads to repeat sales from happy, satisfied customers.

Every Day-Brite lighting unit is built and backed by an organization known the country over for top-quality lighting fixtures...with wide experience in all phases of fluorescent lighting...with practical knowledge of both commercial and industrial lighting.

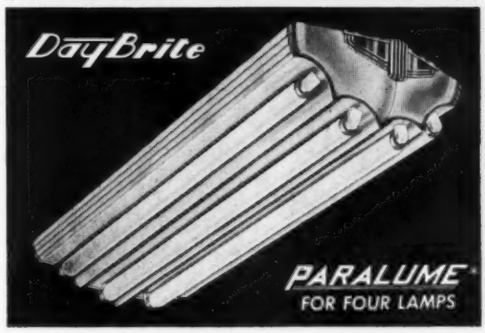
Your sales, your profits and your prestige all increase when you sell only well-known, top-quality, correctly-engineered lighting equipment. By making satisfied customers and building repeat business, Day-Brite assures you of big dividends in the long run.

DayBrite LIGHTING, INC.

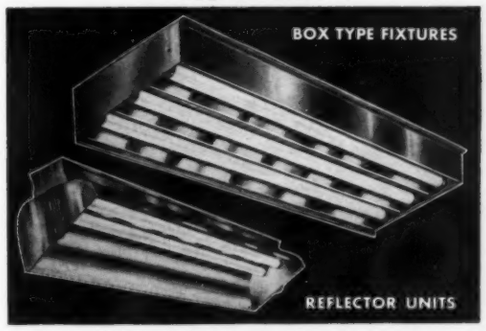
5435 Bulwer Avenue St. Louis, Mo.

Write for complete catalog

*T. M. Reg. U. S. Pat. Off.



For Stores, Offices and All Commercial Applications



Show Window Lighting — for all size lamps
Box Type Fixtures — for two, three and four lamps parallel
Reflector Units—for one and two lamps parallel

— for Industrial Lighting { *2-Light 40-watt* / *2-Light 100-watt*

LOXON GRIPON

. . . guard against breakage and theft!

THE NEW LOXON
No. 1427-A

THE NEW GRIPON
No. 1602-A

The McGILL LoXon Guard is your best assurance for protection against breakage and theft because it locks on with a key! However, where theft is a minor issue, the Gripon is fully as effective against breakage. The only difference in construction is that the key locking device on the LoXon is replaced by plain steel screws on the Gripon. New improvements have recently been made on these two guards:

1. Shape has been changed to conform to new style lamps.
2. Heavier wire is used — No. 14 instead of No. 15.
3. Both LoXon and Gripon are available with or without reflectors.
4. There is NO increase in price — only increased value for the user!

McGILL Products Can Be Secured from Your Electrical Wholesaler.

McGILL MANUFACTURING CO.
Electrical Division, VALPARAISO, IND.

McGILL

Better Lighting

[FROM PAGE 36]

register niche are lighted by a continuous row of 60-watt white lumiline lamps.

Emphasis is given to the baked goods placed in the wall cases by special lighting achieved by placing 25-watt inside frosted lamps on 7-inch centers behind the opal glass panels.

SURPRISE DECORATION—Luminous paint decorations in a night club revealed by intervals of ultra-violet light.

BLACK LIGHT— ANOTHER IDEA TO SELL

Black light has a host of applications, in night clubs, to create eerie effects; in laundries to reveal invisible markings; in luminous murals for theaters; luminous aisle lighting; decorative niches with luminous figures; flowers in lobby and poster display. "Black light" is ultraviolet which is invisible to the naked eye. When it strikes certain substances, however, they glow and give off light.

Although there are a wide variety of chemicals, greases, cosmetics which will glow for some time when activated by ultraviolet, it is only within the past few years that powders and paints have been available for application to surfaces to obtain fluorescent effects. A pint will cover some 60 square feet and most effects are generally quite localized.

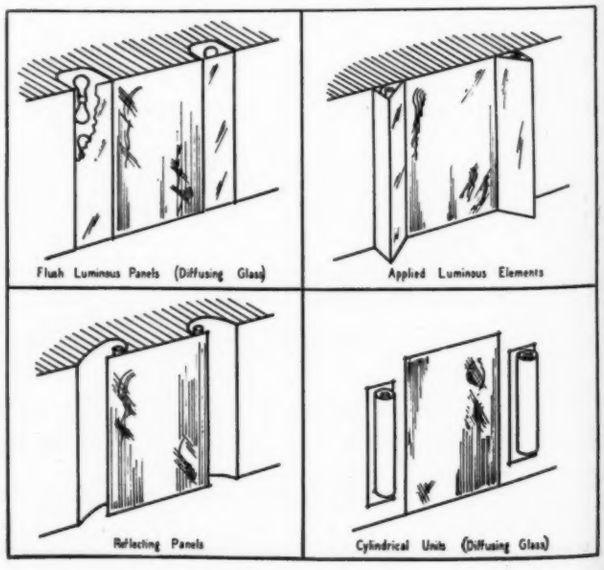
There are several sources which are especially suited for providing the necessary ultraviolet. They are: the 250 watt A-H5 mercury lamp, the 100 watt B-H4 black bulb mercury lamp, the A-H4 mercury lamp and the 2½ watt argon glow lamp. The size of lamp required is dependent upon the area to be lighted and the distance at which the equipment is located from the material. In the case of the argon lamp, it can energize an area only 1 to 1½ square feet at a distance of 1½ to 2 feet. The watts required per square foot for different applications are—

1. Advertising effects with considerable surrounding light 5 to 10 watts per square foot.
2. Advertising effects with fairly dark surroundings 3 to 6 watts per square foot.
3. Decorative treatments 2 to 4 watts per square foot.
4. Auditorium treatments in theaters for "picture lighting" 1 to 2 watts per square foot.

MURAL LIGHTING

A modern trend in restaurant decoration is toward the use of murals. Whether they be photo-murals, tapestries, paintings, or intaglio plaster

MIRRORS — They need low brightness diffusion sources—panels, luminous recesses, attached fixtures or portable units, so placed as to direct the light to the patron or observer. Where space and method permit, a second circuit with daylight lamps may be used for make-up during daylight hours.



33 REASONS WHY You're Assured BEST POSSIBLE RESULTS when you specify BENJAMIN FLUORESCENT LIGHTING UNITS

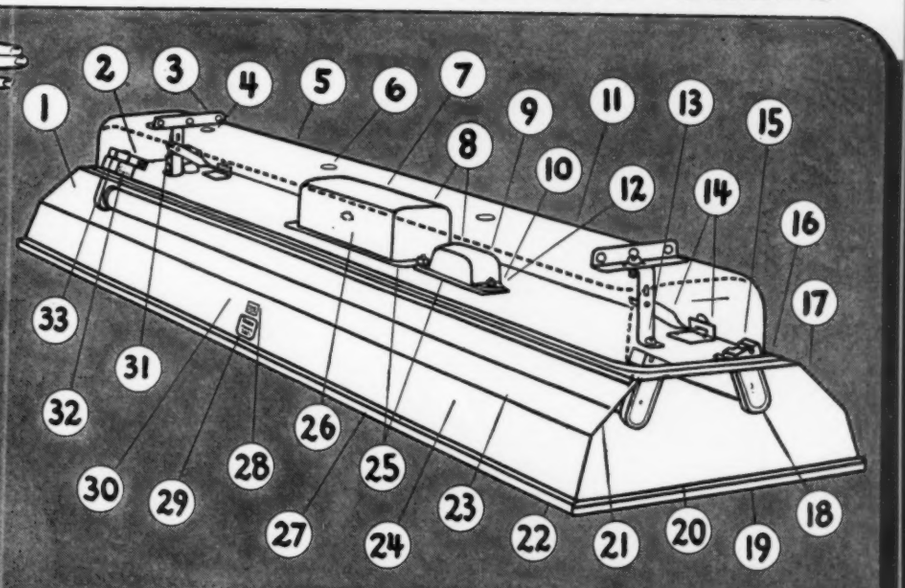
EVERY ONE OF THESE 33 "STREAM-FLO" FEATURES IS ESSENTIAL TO:

1. Lighting performance

that meets the high standards established by Benjamin, the RLM Standards Institute and the requirements of the Science of Seeing.

2. Durability

that meets the Benjamin standards for heavy duty service. Built like a Battleship to insure long life efficiency, lowest operating and maintenance costs and greatest freedom from service interruptions.



Call on Benjamin

To Solve Your Defense Production Lighting Problems... AT YOUR SERVICE ARE *Benjamin Distributors*, skilled in applying the most approved lighting practice to specific problems—*Benjamin's Engineering Department*, recognized as one of the most experienced in the industry—*Benjamin's manufacturing capacity*, largest in the industrial lighting equipment field—*Benjamin's complete line of lighting equipment*, the result of 40 years of specialization in the design and manufacture of lighting equipment for practically every industrial requirement... Fluorescent, Incandescent, Mercury.

BENJAMIN IS READY TO MEET YOUR EMERGENCY REQUIREMENTS... ready to give you the lighting recommendations and the delivery service you require. Call on Benjamin.

SEND NOW FOR A FREE COPY OF THIS NEW FLUORESCENT LIGHTING MANUAL JUST OFF THE PRESS...

Address Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

RLM

These 33 Features of Benjamin RLM "Stream-Flo" Units enable you economically to increase Seeing Efficiency and Production

NEVER in our history has it been so important that immediate steps be taken to increase the *Speed and Ease of Seeing* so as to improve production, increase accuracy of workmanship, safety and all-round employee efficiency. Never before has there been available, in such a period as this, a tool so admirably adapted to this purpose as the cool, economical, Daylight lighting provided by Benjamin Fluorescent Lighting Equipment.

These 33 features built into Benjamin RLM "Stream-Flo" Units indicate the thoroughness with which all Benjamin Fluorescent Lighting Units are engineered and constructed. In these 33 features you will find the evidence of engineering leadership which has made Benjamin the leading maker of lighting equipment for industrial and commercial use.

It will be to your interest to write now for a copy of the new Benjamin Manual on Fluorescent Lighting containing the data sheet detailing each of the 33 "Stream-Flo" features and complete information about all other Benjamin Fluorescent Units. This Manual will give you the facts which are leading more industrial concerns, consulting engineers and others to specify Benjamin equipment than any other. Address the Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

BENJAMIN

TRADE MARK

LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

OFTEN IMITATED
. . . NEVER EQUALLED

"Since 1857"

JAWS that grip like a vise—knives that shear through the toughest wire—handles with just the right spring for comfort—that's Klein pliers!

Ask any man who knows good tools—he'll tell you, "Klein's for satisfaction"—every time!

Your copy of the Klein Pocket Tool Guide will be sent on request.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor:
International Standard Electric Corp., New York

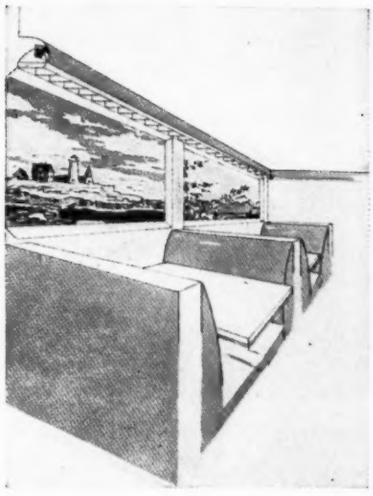
Mathias **KLEIN** & Sons
Established 1857 — Chicago, Ill. U.S.A.

3200 Belmont Avenue, Chicago, Illinois

Better Lighting

[FROM PAGE 38]

panels, their attractiveness is immensely enhanced by subtle lighting treatments. For this lighting service the slimness of the fluorescent lamp makes it an excellent source to use. The sketch shows the way it may be applied to produce the desired lighting effect. This lighting may also be adequate for the tables which are located close to the walls.



***DIRECT COVE** fluorescent lighting illuminates wall murals and tables in this restaurant.*

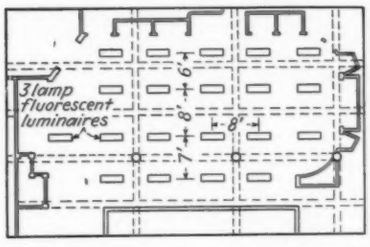
Lighting a CLOTHING SALESROOM

PROBLEM—To provide lighting of adequate quality and intensity for effectively displaying uniform jackets and dresses in a salesroom.

CONSTRUCTION DATA—The area, approximately 50-feet long by 30-feet wide is surrounded by show cases and displays. The ceiling is 16-feet high. The walls, ceiling and trim are finished in light color. Ceiling beams form 17- by 8-foot bays.

SOLUTION OF PROBLEM—Three-lamp, 48 inch, surface mounted fluorescent luminaires are installed on approximately 8-foot centers, two units per bay. Slight variation in the regular spacing was made to avoid shadows from a large air duct. Wiring is installed on the surface.

RESULTS—Diffused lighting of approximately 35 foot-candles is obtained. The close unit spacing and wide direct distribution eliminates shadows from the ceiling obstructions.

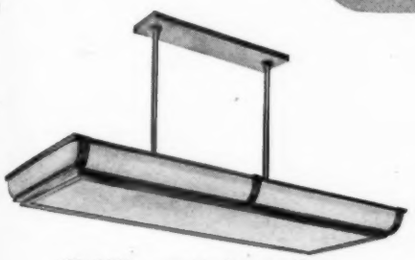


LAYOUT PLAN *of the sales area showing the spacing and arrangement of the three-lamp ceiling fixtures.*

SURFACE MOUNTED *fluorescent luminaires in a modern salesroom.*

WESTINGHOUSE supplies the answer

Westinghouse CL-160 fluorescent luminaires and CL-40 strip units combine in this haberdashery to provide the right "light for selling."



CL-160, semi-indirect fluorescent fixture with 4 lamps.

Four-Lamp Fluorescent Fixtures Bring Higher Illumination Levels

Modernly styled Westinghouse CL-160 fluorescent luminaires set new standards of illumination efficiency in both small and large business establishments. By utilizing to full advantage the desirable illumination characteristics of fluorescent lamps, they deliver better light . . . more light . . . and cooler light.

Efficiency-wise features of Westinghouse CL-160 fixtures include: high intensities without glare . . . design and finish that blend with all architectural interiors . . . quality-proved ballast equipment that provides a power factor of 95 to 99 per cent and minimized flicker . . . three types of light distribution . . . semi-indirect lighting from four 40-watt lamps . . . simplified installation and servicing.

Ask your nearest Westinghouse Lighting Distributor for the new Commercial Fluorescent Catalog Sections. Or, write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, Ohio.

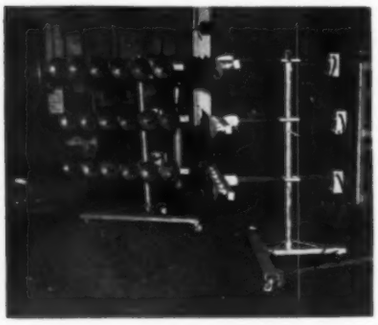
117 Westinghouse Electric Supply Company offices and Independent Lighting Distributors provide local stocks and services.

Westinghouse Lighting Equipment

Motor Shops

INFRA RED BAKING

Infra red heating lamps are used for drying and baking purposes in the motor shop of the Economy Electric Co., one of the largest motor repair shops in Youngstown, Ohio. With these lamps baking operations that usually take eight hours in an oven, require only three hours. And, being portable, the units can be taken to the job to dry out motors and other electrical apparatus that has been damaged by water. The units are also used to dry paint on apparatus that has been repaired in the shop.



***HEAT LAMPS** prove profitable for drying and baking processes in this motor repair shop. Portability increases scope of their use.*

Two portable units are used. Each consists of a bank of 18-260-watt infra red lamps in gold plated reflectors and mounted in three rows of six lamps each. Two lamps are connected in series for 220 volt, single phase operation. Three snap switches mounted on the lamp wiring trough control the units. In addition, each row of units is controlled by a disconnect switch mounted on the end of the horizontal supporting pipe arms. These arms are mounted on a vertical pipe support which is 68 inches high. Each arm has a 30-inch straight-line horizontal adjustment and a 360 degree adjustment in the horizontal plane. Each row of units also has a 180 degree adjustment in the vertical plane. By means of these adjustments the lamps can be arranged as a heating tunnel or in two vertical planes.

When used for drying and baking operations in the shop the lamps are positioned on each side of a portable rack on which the apparatus to be dried is placed. The use of these units has speeded up the delivery time on motor repair work and, because they can be taken to the job, dismantling, trucking and reassembling time has been elimiated on water damaged equipment that requires only a good drying out.

CLOSE QUARTERS HOIST

For one man handling of heavy motors from trucks to shop or storage in limited space, the Commodore Electric Co. of Chicago had to adopt handling hoists to occupy a minimum of useful floor space.

The hoistway, 4 by 6 feet, extends from the basement storage to the second floor shop and adjoins the receiving door. An L shaped monorail extends out over the loading space and curves sharply in to the hoistway.

***MONORAIL HOIST** and hoistways permit one man motor handling in a limited area.*

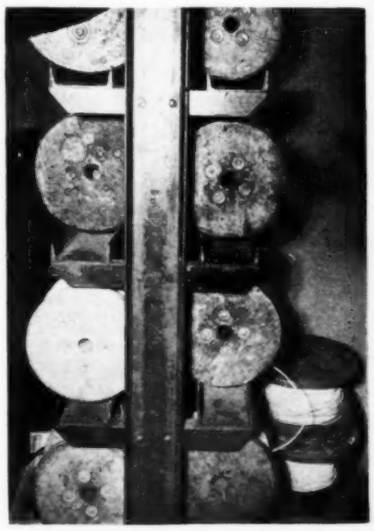
A motor driven chain hoist operates in the hoistway, picking up from the hand operated hoist on the monorail.

The hoistway openings are covered with plates when not in use.

MAGNET WIRE STORAGE RACK

A storage rack for magnet wire was designed and built with channel and angle iron in the motor repair shop of the L & P Electric Co., Brooklyn, N. Y.

The rack is 52-inches deep and 6-ft. 10-inches high. The spool supports consist of 5-in. by 1¾-in. channel iron supported by 18-inch cross pieces of 2-in. by 2-in. angle iron. The 15-inch spacing of the tiers gives ample clearance for all reels up to 12-inches in diameter.



***REEL RACK** of channel and angle iron in the winding department of this motor shop encourages systematic and orderly storage of various sizes of magnet wire.*

LEGIBLE COLOR-CODED STOCK TAGS

The Ampere Electric Company, motor repair shop, of Philadelphia, Pa., maintains a considerable stock of used electric motors of various phase and voltage characteristics. Like most repair shops, the problem of keeping the stock tags, bearing the essential name plate data of the equipment, clean and legible and free from dirt, grime and grease was encountered.

To assure legibility at all times, of the data on the tags, the shop manager placed strips of transparent scotch tape over the inscribed information. Thus, if by chance the tag became

ON DEFENSE CONTRACTS . . .

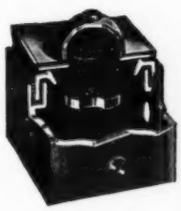
INSTALL THE LINE THAT SAVES YOU TIME . . .

NO. 285 DOUBLE DUPLEX RECEPTACLE NOZZLE Attractive and easy to install. Shown here with No. 200 cover plate.

NO. 284 DUPLEX RECEPTACLE NOZZLE Compact and neat. Available with ½" or ¾" brass pipe extension. Also Latrobe Duplex Telephone Nozzles.

NO. 330 LATROBE TOM THUMB UTILITY OUTLET For use in wood installations and other locations free from moisture or mechanical injury.

NO. 251-R ADJUSTABLE GANG FLOOR BOX Similar to our No. 130 round cover box, except sides are flat to provide for extra conduit holes. Furnished with No. 208 receptacle and cover plate with 2-in. flush brass plugs.



NO. 252-R TWO GANG BOX Adjustable Floor Box with No. 208 Receptacle in one section. Cover plates have ½" and 2" flush brass plugs.

LATROBE

FLOOR BOXES

and

WIRING SPECIALTIES

• Complete in every respect . . . made to exacting standards . . . dependable and safe in every phase of operation . . . all these are inherent qualities of LATROBE Floor Boxes and Wiring Specialties. But, of great importance today, when increased business calls for maximum speed in installation, are the *space, labor and time saving features of every LATROBE product.* Designed to facilitate location, each of the many Floor Boxes and Wiring Specialties bearing the LATROBE trade-mark can be of special value to you on current stepped up defense contracts. Your customers, too, benefit from a LATROBE installation. Long life, efficient service and flexibility of use are a few of the many benefits that they can expect. So, make more from your defense contracts (and your regular business, too) —and give your customers more, with LATROBE Floor Boxes and Wiring Specialties. A letter to us will bring complete details. *Write!*

LATROBE ADJUSTABLE WATERTIGHT FLOOR BOXES

NO. 120 Box with No. 206 Stem Nozzle | **No. 140 Box with No. 206 Nozzle** | **No. 150 Box with No. 207 Nozzle.**

These Underwriters' Approved boxes, with 3½" and 4¼" round cover plates, are suitable for installation in concrete floors or in wood finished concrete floors. Unique in design, neat appearing, with few parts, they're quickly and easily installed. Tops of boxes are easily adjusted to set flush and level with floor surface.

FULLMAN MFG. CO.

Headquarters for quality Floor Boxes and Wiring Specialties

LATROBE **PENNA.**

THE NEW WHEELER
"DAY-LUX"
FLUORESCENT LUMINAIRES
FOR LIGHTING
Offices, Stores, Hotels,
Clubs, Restaurants,
Theatres, Public Buildings, etc.

Here is a new line of distinctive, beautifully designed Fluorescent luminaires made especially for general illumination purposes in commercial locations.

These fixtures furnish an abundant quantity of the soft, cool daylight illumination which makes seeing easy and working conditions ideal.

"DAY-LUX" Luminaires, which utilize 40-watt lamps, are available in two- or four-lamp construction.

All fixtures are supplied complete with white lamp holders, high power factor Tulamp ballast equipment, and removable and renewable separate starter switches located on the top of the units.

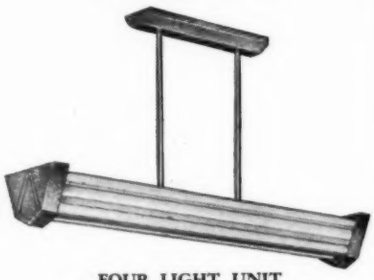
Reflectors are constructed of white enameled steel. Decorative end caps and canopy finished a beautiful crackled aluminum.

As illustrated, fixtures can be supplied with panels of frosted glass, or without glass.

All units are furnished with ballasts for 110-125 volts, 60 cycle A.C. operation.

Length of stems: 24" standard.

FOUR LIGHT UNIT
WITH GLASS PANELS



FOUR LIGHT UNIT
WITHOUT GLASS PANELS

TWO LIGHT UNIT
WITH GLASS PANELS

TWO LIGHT UNIT
WITHOUT GLASS PANELS

FOR MOUNTING CLOSE TO THE SURFACE

If desired for surface mounting, fixtures will be furnished with 6" stems.

For complete data write for New Bulletin No. 65-A

Distributed Exclusively Through Electrical Wholesalers

WHEELER REFLECTOR COMPANY
275 CONGRESS ST., BOSTON, MASS.
NEW YORK ATLANTA CLEVELAND

Motor Shops

[FROM PAGE 42]

dirty and grimy, it could be cleaned with a damp cloth and legibility restored.

To differentiate between motors of different phase characteristics, colored stock tags were used, employing the following color code:

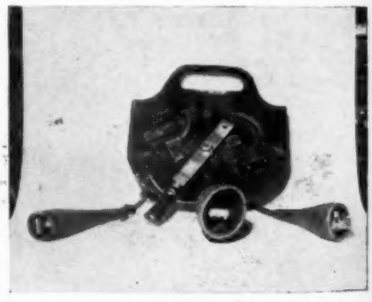
Yellow—two phase
Green—three phase
Blue—single phase
White—direct current

This simple method saves much time and energy when looking for a specific motor and is especially helpful during inventory periods. It's just another step toward systematic stockkeeping.

SHORT CIRCUIT TEST SWITCH

The Electrical Installation Co., electric motor repair shop of Cambridge, Mass., uses this portable short circuit test switch, which it designed and built for testing slip ring motors.

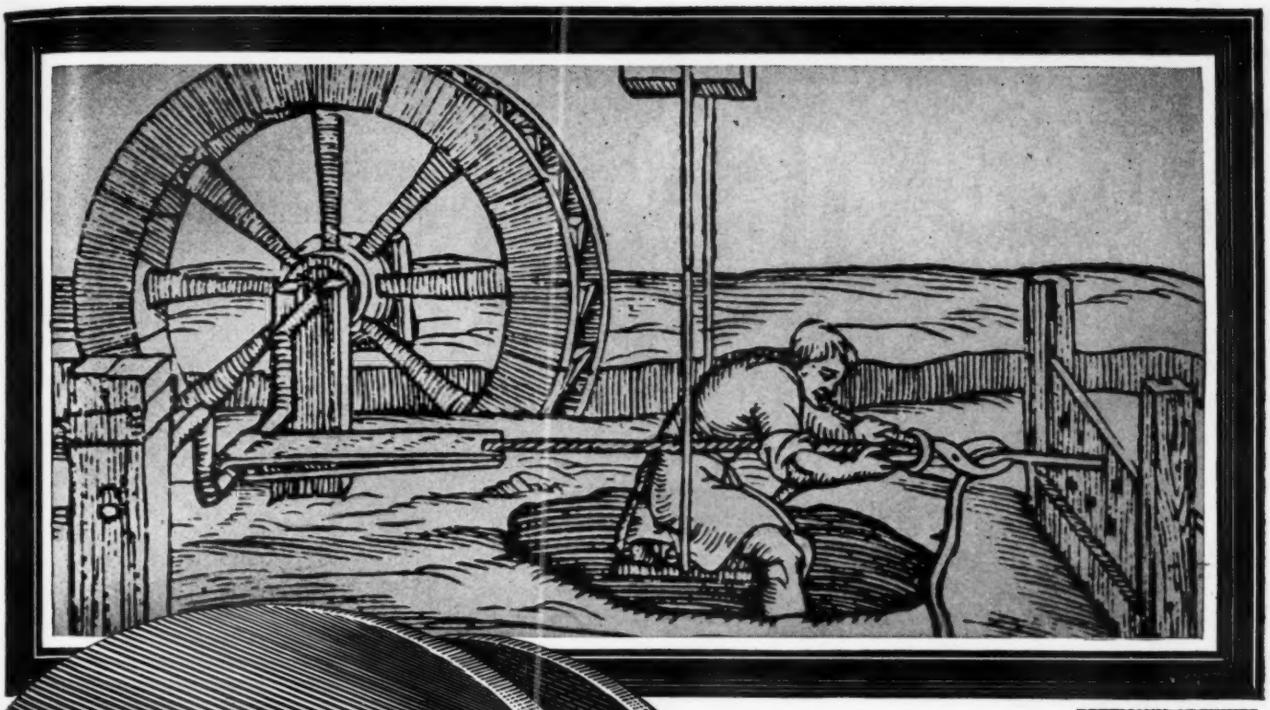
The device consists of a piece of fibre board on which are mounted a single knife blade pivoted in the center and two knife blade clips mounted, one on each side of the blade. Test leads, connected to each blade clip and to the center of the knife blade, terminate in spring clips protected by



***SHORT CIRCUIT** tests on slip ring motors are a simple matter with this short circuiting device. No more disconnected and twisted leads at this motor shop.*

rubber hoods. A handle cut into the top of the piece of fibre, facilitates holding the device.

When using this switch, the three leads are clipped to the slip ring brush leads and the test made, first with the knife switch open, then with it closed shorting the three leads. Time formerly used in disconnecting the brushes and twisting together the leads to make the short circuit test is now eliminated. And the device is handy and safe.



BETTMANN ARCHIVES

This 400-year-old engraving records the first application of power to wire drawing. The workman's swinging seat was the labor saving device of the day.

EACH ADVANCE of the past in the art of wire making has been heralded in the terms of *greater uniformity and improved quality.* Today, General Cable Research Laboratories control production of electrical wires and cables within tolerances which only a scientist can measure, but which are of great importance in terms of ultimate installation usefulness.

GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

STOCKED BY ELECTRICAL WHOLESALERS EVERYWHERE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

ILG KITCHEN VENTILATORS

Now PRICES START AT $16.50 RETAIL

ANNOUNCING NEW Ilgvent TO MAKE EVERY FAMILY YOUR PROSPECT!

BIG NEWS! Meet the new modestly priced genuine Ilg Kitchen Ventilating Fan! Here's your timely answer to ventilating needs of kitchens, bathrooms and rumpus rooms in compact, modern homes and apartments! In one smart, streamlined unit *you get* guaranteed capacity of 350 C.F.M. (ample air change for small kitchens) . . . low initial cost . . . low operating cost . . . supremely quiet, free running operation. Three models—"Built-In", "Portable" and "Package-type"—with prices (including full profit margin) starting at $16.50 retail! For complete details, write, wire or phone your distributor or nearest ILG office today!

ILG ELECTRIC VENTILATING CO.
2879 N. CRAWFORD AVE., CHICAGO, ILL.
Offices in 43 Principal Cities

ILG

*Vitalized** VENTILATION
AND AIR CONDITIONING
*AIR CHANGE...NOT JUST AIR MOVEMENT!

Free KITCHEN FAN DEMONSTRATORS

Makes selling of ventilation simple as "rolling off a log"! Easy to carry . . . colorful . . . realistic . . . practicable! Use as window or counter display—for demonstration in the store or in the home. Demonstrator above FREE with purchase of "Built-in" Ilgette (500 C.F.M.) Model, for permanent installation in wall of new or modernized kitchen.

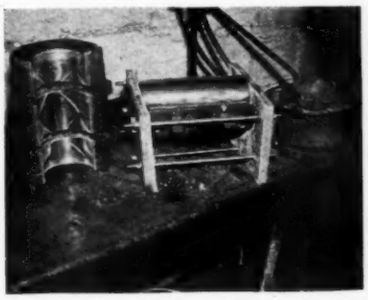
Helps salesmen remember selling points because features are listed on back of each demonstrator. Salesmen can *show* and *tell* a story of "benefits" . . . a story of "mechanical perfection" . . . and make the dramatic "match test" featuring ILG's exclusive self-cooled miracle motor that "breathes"—never "gums-up". Demonstrator above FREE with purchase of "Portable" Ilgette (500 C.F.M.) Model, for tenants of rented homes or apartments.

HOLDER FOR RE-BABBITTING BEARINGS

Electrical Engineering & Service, Inc., motor repair shop of Westfield, Mass., has developed a simple, yet effective form to hold bearings for re-babbitting.

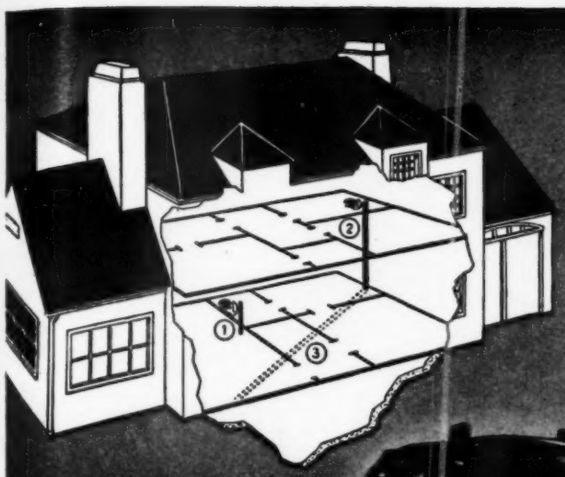
It consists of two pieces of ¾-inch, five-ply wood lined with ¼-inch asbestos board. Each of these end pieces is 13½-inches long and 8½-inches high. Six long bolts with long threads on both ends, two pieces of flat iron, a piece of stove pipe of proper length and diameter and some asbestos rope complete the equipment necessary.

When assembled, the bearing is held between the two pieces of ply wood, with the asbestos lining pressing against the ends of the bearing. The four outside bolts hold the bearing while the stove pipe is inserted. Then the two center bolts, one going through the pipe, are inserted and tightened. Two pieces of flat iron reinforce the wood sides at the point of greatest strain—where the bolt goes through the pipe. The diameter of the length of pipe is 1-inch less than that of the finished bearing lining, thus allowing ½-inch for final machining. All ridges and holes are plugged with the asbestos rope. The asbestos board lining on the end pieces is sufficiently soft to make a snug fit against the bearing ends.



***SIMPLE FORM** for holding bearings to be re-babbitted. Can be used for all bearing sizes, with changes in core and bolts. Bearing shown is for a 175 hp., 600 rpm. motor.*

The advantages of this type of form, as listed by the shop foreman, are—it can be used for all sizes of bearings, the only changes being the length of the bolts and the length and diameter of the stove pipe core; it is open on all sides, making it easy to plug up any leaks that might develop; the hollow core heats up more quickly than a solid one, thus cutting the pouring time considerably; compared with the use of clay, this is much cleaner.



TELEPHONE CONDUIT ADDS GREATER VALUE TO YOUR HOMES . . . .

Now still greater values can be added to the homes designed with multiple telephone outlets. Home owners appreciate their added convenience and step-saving features and accept multiple phone outlets as a sign of a modern home. The cost is no greater than standard light outlets.

A few short lengths of conduit, installed when the house is built, give assurance to the owner that the job is permanent, that nothing need to be torn apart in the future to change a phone location.

When it comes to conduit specifications—*specify Buckeye*—the largest selling conduit in America. Buckeye Conduit is made as a very important specialty by Youngstown, and the trade likes it because of its consistent uniformity and easy workability. A Buckeye Conduit specification for phone installations and all electrical requirements is welcomed by discriminating home owners everywhere.

Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steels

General Offices - YOUNGSTOWN, OHIO

Where to Use *Modern* Porcelain Protected Wiring Systems

In Residential, Commercial, Industrial and Institutional Buildings, Porcelain Protected Wiring Offers the Added Safety of Indestructible Insulation and Economical Adequacy.

•

Modern Porcelain Protected Wiring Systems are putting new life into the electrical wiring business. They are providing real sales opportunities for electrical contractors throughout the country in residential, industrial, commercial and institutional wiring installations.

The features which make this system so popular are *Safety*, which has been developed to the highest degree, the elimination of extraneous and unessential conducting materials necessary in some locations for mechanical protection only, and an *Economical Adequacy* that can be compared by no other wiring method. These features have been achieved through the use of all porcelain outlets, conductor supports and the use of dry air as an insulating medium and heat dissipator.

Take, for instance, the hazards that are present in most residential occupancies and which, until the development of the Porcelain Protected System, presented electrical contractors and inspectors with a serious problem. Fixtures in kitchens, bathrooms and basements are representative of particular hazards, and the Porcelain Protected System has overcome this problem most successfully.

When carrying capacity is considered, the electrical contractor is presented with a distinct advantage, either from the point of economy or greater capacity. The 1940 National Electrical Code recognizes the superior carrying capacity and safety of conductors used in this system, so if the contractor's problem is one of economy, he may use a smaller size conductor than permitted in other wiring methods; or, if his problem is that of adequate carrying capacity, he can achieve a larger capacity at lower cost with this system than with any other when like wire sizes are considered. The electrical contractor can apply these features to his best interests in all wiring installations.

•

The same features of safety, durability and economical adequacy also apply to commercial, institutional, industrial and rural installations. Commercial installations require the extra safety and adequacy provided by the Porcelain Protected Wiring System; its superior safety is an absolute essential for institutional buildings and, in industrial wiring where conductors must carry heavy current loads, the greater carrying capacity, economy and safety of this system have proven particularly advantageous. In rural wiring the safety and economy of the Porcelain Protected Wiring System has no peer for safety and economy of installation and operation.

ADVERTISEMENT

Porcelain Protected wiring systems have already been widely adopted in all parts of the Country, and those contractors who are using the system report that when the superiority of this wiring method is explained to prospects, it usually results in closing the sale for wiring services.

Electrical porcelain materials for installation of Modern Porcelain Protected Wiring Systems are manufactured by:

Knox Porcelain Corporation, Knoxville, Tenn.

Porcelain Products, Incorporated, Findlay, Ohio

Illinois Electric Porcelain Company, Macomb, Ill.

and may be obtained through your electrical wholesaler.

Industrial Electrification and MAINTENANCE

MORE CAPACITY

TODAY, as never before, American industry is called on to marshal its production capacity to meet the increased demands of the National Defense Program. And a step-up in production means a step-up in power demands. But, before this additional power can be had, the plant electrical system must have the necessary capacity.

Is the electrical system capable of carrying this additional burden without risk of interrupting the production schedule, through inefficient operation of machinery and overtaxed electrical equipment? If not, the management wants to know why not? And what can be done?

To whom should they logically turn for the answer? Why, to the maintenance electrician, whose responsibility it is to know the plant electrical system inside and out. He knows the location and condition of each piece of electrical equipment, what it can do, what it is doing at present. If the system is not up to par, he knows why—and what to do to remedy the condition. And when the management asks, "What can we do?", he must be ready to offer suggestions.

Now, where is an electrical system apt to be weak? Where should he start looking for trouble? What are the possibilities for increasing system capacity? The answers to these questions will be found in the accompanying discussion. It is offered as a guide to whatever steps need to be taken to provide an adequate, trouble-free electrical system.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand (this issue)

Future articles will discuss—

10. Increasing Flexibility of Electrical Service
11. Safety Protection for Electrical Operations
12. Extending Automatic Control
13. Electrifying Operations to Reduce Unit Costs
14. Methods for Handling Changeovers and Live Circuits

Providing Adequate Capacity for Increased Demand

CONDITIONS of today are pressing increased demands for both the products necessary for our usual mode of living plus the expanded production for national defense. Industry, as never before, must build capacity for this double-duty. This duty must not only be faced by the plant management but by the operating divisions as well.

In the solution of the problem the electrical maintenance man has an important part:

1—To keep the electrical system in perfect operating condition so that there will be no production interruptions or delays caused by failure of electric service or equipment.

2—To see that adequate capacity is available for present operation so that proper voltage will be supplied and power losses minimized.

3—To make provisions for further increased demands so that production machines, portable tools, lighting units, and other power consuming equipment can be added as the plant expands.

How can adequate capacity be provided to meet increased demands? The alert electrical maintenance man first recognizes limited capacity conditions and seeks ways to eliminate them. He strives to make improvements wherever possible elsewhere. There are various ways, of course, to do this, and they are discussed here both as they relate to individual electric equipment, in the Maintenance Guide Sheet, and to overall operation of the electrical system, including some plant operations.

1. Improve Power Factor

As more machines are added to expand production, more load is added to the plant's electrical system. Induction motors usually constitute the major portion of that load. Underload operation of motors accounts for most conditions of low power factor, and when motors run idle, the power factor is very low. For example, a typical 7½-hp., 1800-rpm. general-purpose, squirrel-cage motor has a power factor of 88 per cent at full load, 84 per cent at ¾ load, 74 per cent at ½ load, and 58 per cent at ¼ load.

SUPPLEMENTARY LIGHTING *provides high intensity illumination (150 foot-candles) for welding and assembly of fine parts for radio tubes in plant of Hygrade Sylvania Corp. Fluorescent lamps are mounted in continuous channels (arrows) 10 in. above work plane. Overhead fluorescent Miralumes provides an additional 20 foot-candles.*

***NEW LOAD CENTER** (rear view) at American Cyanamid and Chemical Corporation, has room for expansion. Buses can be sectionalized to permit additions without interruption.*

The excitation or lagging reactive current of a motor flows back and forth in the supply circuit and increases the amount of current in the line. It is necessary, therefore, to reduce this reactive current and increase the power factor by proper application of motors, by using synchronous motors, or by installing capacitors.

Underloaded transformers are another source of low power factor and should be replaced by smaller sizes suitable for the load. Transformers that have no secondary load should be disconnected.

Again large circular mil conductors run in air have poor inherent power factor. To minimize the condition on circuits of 600 volts or less, 500,000 cir. mil size should be used for replacement, using as many cables as necessary per phase to carry the load.

Power factor also is improved from the point of correction on the line back to the generator. Hence the capacity of the line conductors, switches, transformers, and other parts of the distribution system provide more capacity. They are seemingly increased, that is, they can carry a greater load of useful current.

Further details for improving and maintaining good power factor are given in this section of *Electrical Contracting,* December 1940. An example is given to show how increased capacity can be obtained by correcting power factor, by explaining how a midwestern plant improved operation of equipment and reduced power losses.

Operation of small motors and slow-speed motors was the cause of poor power factor, with resulting energy losses. Installation of 90 kva. in capacitors at strategic locations, and replacement of a number of slow-speed motors with high-speed motors, raised the power factor to almost 100 per cent. Improvement of power factor increased substation transformer capacity by reducing the load from 250 to 130 kva., almost 50 per cent. Thus the company had increased reserve in case of trouble or increased load.

2. Maintain Normal Voltage

Electrical operating equipment is designed to be used at normal or rated voltage. Operation at low voltage is more common, however, than high-voltage operation. But it is true that some apparatus and devices will operate at plus or minus 10 per cent of rated voltage. Motors are in that class and their operating characteristics change with variation in voltage.

Consider the general-purpose motors operating at rated load and at 10 per cent below rated voltage. For a.c. motors, torque varies as the square of the voltage. For d.c. motors, it varies directly as the voltage. Speed for a.c. motors will be one per cent less; for d.c. motors, five per cent less. Full-load current for a.c. motors will give 10 per cent increase; for d.c. motors 12 per cent increase. Efficiency for a.c. motors will show two per cent decrease; for d.c. motors, slight decrease. Temperature rise for a.c. motors will be 14 per cent increase; for d.c. motors, very slight effect.

Illumination is another item affected by variation in voltage. For when incandescent lamps are operated at 10 per cent below rated voltage, the wattage consumed is 15 per cent less, but the lumens are 30 per cent less. So for each one per cent decrease in voltage, the decrease in lumens is three per cent.

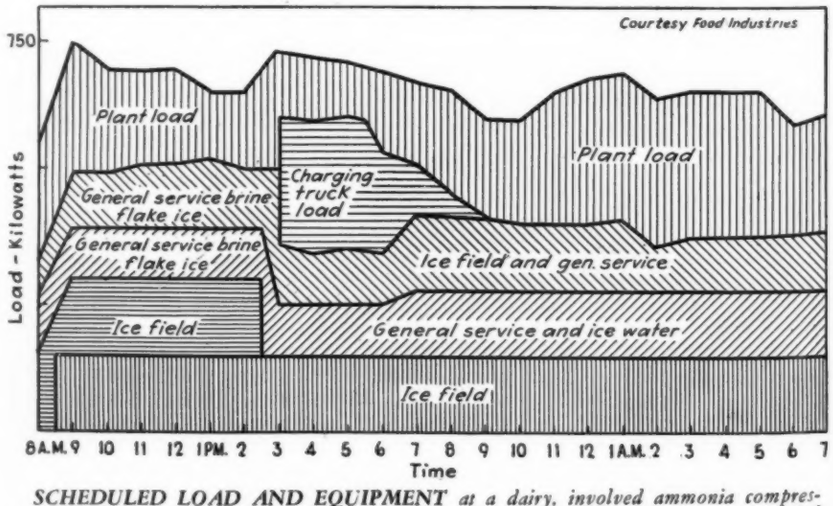
For fluorescent lamps, lumen output varies between one and two per cent with one per cent variation in voltage. If the drop in line voltage exceeds 10 per cent, the lamp may be difficult to start. Also undervoltage and overvoltage have a detrimental effect on lamp operation and lamp life. When operated within their normal range, however, fluorescent lamps are not as sensitive to voltage variation as incandescent lamps. For further details see "Performance of Fluorescent Lamps" by Harris Reinhardt, in *Electrical Contracting,* Jan. 1941.

3. Schedule Operations and Equipment

An analysis of the electric load in most industrial plants will reveal interrupted operation of some machines, which adds the factor of intermittent load to the system problem. Machines will draw an extra heavy current at one or more points of a specific operation and be the cause of high peaks in the electric load curve. In either case, the electric system is taxed if suitable provision has not been made to take care of the increased current requirement. Low voltage may result. In addition, this method of operation will most likely be reflected in the plant's energy demand charge.

A careful study of production operations may show that some or all the "offending" machines, or other electrically operated equipment such as furnaces, can be operated at other times. Production operations may be scheduled so that some machines can be shut down while others are in use. Another arrangement is to operate certain machines on another shift.

Re-scheduling of operations can sometimes be arranged conveniently. This is so, especially when the trend is toward 24-hr. plant operation as dur-


Courtesy Food Industries
750
Load - Kilowatts
Plant load
General service brine flake ice
General service brine flake ice
Charging truck load
Plant load
Ice field and gen. service
Ice field
General service and ice water
Ice field
8 A.M. 9 10 11 12 1 P.M. 2 3 4 5 6 7 8 9 10 11 12 1 A.M. 2 3 4 5 6 7
Time

***SCHEDULED LOAD AND EQUIPMENT** at a dairy, involved ammonia compressors and engine room auxiliaries with a combined rating of 1,176 hp. It included motor generator sets of 350 hp., conveyors and milk equipment of 225 hp., miscellaneous refrigeration of 50 hp., general building load of 274 hp., boiler room equipment of 46 hp., and lighting of 200-kw.*

MAINTENANCE GUIDE SHEET

ELECTRICAL EQUIPMENT THAT HELPS PROVIDE ADEQUATE CAPACITY FOR INCREASED DEMANDS

Power Supply Equipment

1. Use generating unit or units held in reserve.
2. Reduce peak loads by re-scheduling operation of large power-consuming apparatus and apparatus drawing heavy peak current.
3. Improve and maintain a good power factor for plant.
4. Have standby central station service established.
5. Arrange for use of duplicate incoming service.

Distribution Equipment

1. Switchboards and Switchgear—Use breakers and switches having adequate current-carrying capacity. Provide suitable overload devices, also low-voltage, under-voltage and phase-reversal protection, and ground indicators. Insure safety of operation by scheduled inspection and servicing. Modernize for economics. Locate switching equipment to shorten feeders. Consider silver plating of oil circuit breaker contact tips to reduce pitting.

2. Transformers—Place at load centers throughout plant, to obtain good voltage regulation, to minimize voltage drop and to permit shorter lengths of secondary conductors and economical size of primary conductors. For additional capacity, use air-cooled or non-inflammable types instead of vaults. Schedule test for oil insulation.

3. Circuits—Check sizes, capacity and load. Avoid overload and excess of 2 percent voltage drop. Larger cables have lower I^2R loss and have leeway for future. Use cable sizes not over 500,000 circ. mils, for ease of handling, simplicity in increasing capacity, and less reactance drop to effect voltage drop. Watch effect of new NEC wire rules. Consider use of bus type of feeder. Have adequate places for branch-circuit taps and assorted sizes of plug-in devices.

4. Distribution Cabinets—Install additional cabinets for increased number and shorter runs of branch circuits. Use new cabinets and have spare branch taps. New style panels with latest type of circuit breakers provide more circuits in same space, can be used often in the old box.

5. Outlets—Provide more heavy duty outlets for welders and other portable machines. Install additional outlets at convenient locations for use of portable tools, extension lamps, soldering irons and glue pots.

Operating Equipment

1. Motors and Drives—Consider individual and group drives, also dividing group drives into smaller sections. For speed changes, use variable speed reducers with constant-speed motor. Improve power factor by using highest speed motor consistent for drive. Use gearmotors for slow-speed drive, with high-speed motor that requires minimum space. V-belts are suitable for short-center drives and eliminate transmission of vibration. Motors built to new NEMA Standards provide greater efficiencies.

2. Starters and Controllers—Have contacts and other current-carrying parts of adequate capacity. Maintain contact tips in good condition. Silver tips reduce pitting and welding. Use of more control devices permits isolation of departments and machines and reduces trouble.

3. Pushbuttons—Locate convenient for operator. Use duplicates at other locations to save steps and delays.

4. Furnaces and Ovens—Provide adequate heating capacity for the respective work. Smaller sizes can be used on work benches or separate stands. Use conductor insulation suitable for high temperatures.

5. Welders—Provide connection facilities convenient for operators. Welding can be done with either direct or alternating current. Units are available for welding currents as low as 10 amp. A-c welders increasing in use.

Illumination

1. Light Intensity—As a guide for industrial plants, see IES recommendations on light levels as measured in foot-candles. Use of silver bowl incandescent lamps will eliminate glare. Fluorescent lamps have a high lumen output per watt and can be obtained in various colors. Additional lamps placed near the work plane supplement general illumination and provide a higher intensity of light.

2. Operation of Lamps—Maintain socket voltage same as rated lamp voltage, for normal lumen output and life. Use suitably enclosed lamps for specific atmospheric conditions.

3. Maintenance—Light intensity is effected by dust and dirt on lamps and by hours of use. Schedule cleaning of lamps, reflectors and lenses to permit maximum amount of light consistent with operation.

Instruments

1. Quantity—Check manufacturing operations and maintenance by testing. Determine overloads, slow departments, machines under stress, careless operators.

2. Types—Check load and energy consumption by use of indicating or recording types. Use permanent connection to machine or feeder circuit; socket type for permanent or temporary service. With portable type with leads and plugs for temporary service, adequate use of jacks will permit instrument to be plugged in without interruption of electric service. Use clamp-on type of ammeter with voltmeter combination for testing under load without disturbing circuit. Use portable industrial analyzer (unit equipment) for check or survey of operations.

Renewal Parts and Supplies

1. Requirements—Carry quantity in stock to guard against slow deliveries and to make quick repairs, thus minimizing shut downs and interruptions.

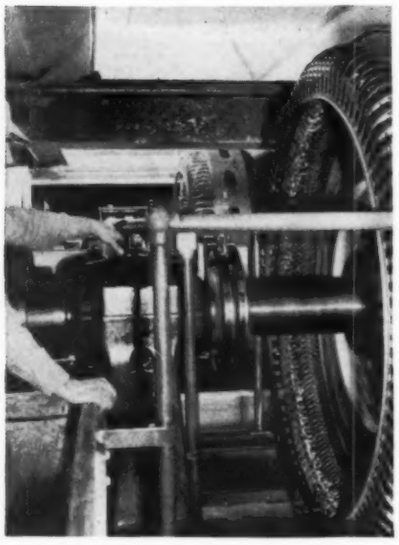
2. Wearing Parts—Include bearings, brushes, commutators, contact tips for starters, face-plate and drum controllers, air and oil circuit breakers.

3. Supplies—Include wire, conduit, switches, cutouts, fuses, conduit fittings, connectors.

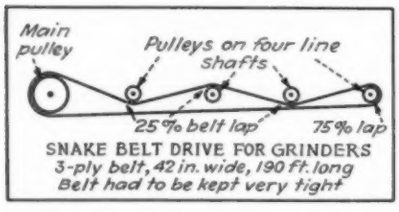
4. Lamps—Have ample supply of proper types.

5. Tools—Have enough for maintenance and repairs.

6. Location—Keep accessible stock in main or general storeroom, department or building stock cabinet. Also know local source of supply.



***A SYNCHRONOUS MOTOR** was coupled to each of four shafts driving grinders. It replaced a snake belt drive (below) which had to be kept very tight to transmit enough power. At Northwest Consolidated Milling Co., Minneapolis.*



SNAKE BELT DRIVE FOR GRINDERS
3-ply belt, 42 in. wide, 190 ft. long
Belt had to be kept very tight

ing the present emergency for rearmament.

Three case studies are presented on scheduling operations and equipment. They show (1) how one company established theoretical peak loads and operated the plant to meet this objective, (2) how two other companies built up off-peak and night operations.

Case 1—Dairies operate 24-hr. a day. One large New York dairy produced results by building up its load as shown in an accompanying illustration, thereby being enabled to operate at a load factor of 80 per cent or an average of four-fifths of the highest peak load for the month.

The procedure—(A) Each month a theoretical peak load is established by determining what the electric load ought to be. (B) Seasonable and market considerations are weighed when the load is set. (C) The plant is operated to a schedule to meet the objective. (D) The load is manipulated reasonably to permit meeting emergencies. (E) Levels of electric power consumption are recorded on a demand meter.

Case 2—An aluminum foundry had a total connected load of 280 hp. A heat-treating furnace consumed approximately 172 hp. This furnace, depending on the quantity of castings, is heated in 2 to 2½ hours and after that the power is on intermittently.

Night operation of the furnace was arranged, when practically no other power is required. On the day shift, the metal is melted and poured, and the castings cleaned and ground preparatory to the heat treatment.

Case 3—Another example of scheduling equipment for night operation is in the granite industry where electric power is used for air compressors, cranes, exhaust fans and hoists. By running polishing plants on day shifts and doing sawing at night, with relatively small crews, economical power application was made possible.

4. Determine Load Centers

As demand increases more production facilities must be made available. Departments are enlarged and new departments are created. This often necessitates an increase in the number and re-arrangement of production machines resulting in an increase of electric power requirements to be furnished by the same circuits.

Unless the original feeder installation was designed for departmental or plant expansion, the low-voltage conductors from the supply source or substation soon will be loaded to capacity and have no reserve. Or they may be overloaded, operate at high temperature, and be the cause of low voltage and higher power loss. To overcome the inadequacy of the secondary circuit, new load centers should be determined and equipment for a building or departmental distribution center installed.

The General Electric Co. solved a similar problem, to obtain adequate power for properly lighting a new production layout at its Pittsfield, Mass., plant. A new distribution system was obtained (1) by cutting the previously used secondary feeder into three sections, (2) installing Pyranol transformers at the middle of each section, and (3) running in exposed conduit a new 2,300-volt primary feeder to supply the transformers.

A saving was made by utilizing existing secondary copper and conduit. In addition, the transformers using a "liquid that will not burn" could be placed indoors. Also, the arrangement permits a further increase of 50 per cent in lamp size when and if needed.

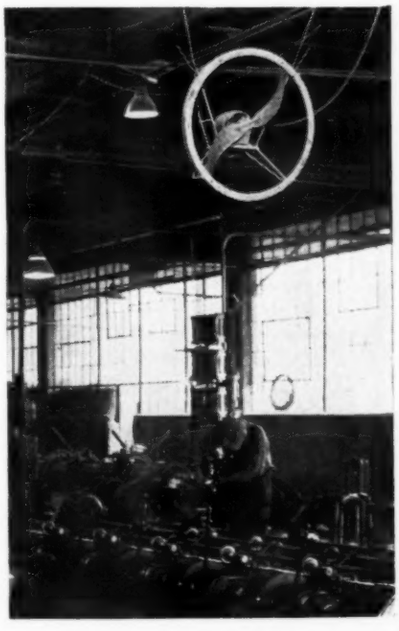
Another case is cited, relating to a well planned load center to relieve plant growing pains for the American Cyanamid and Chemical Corporation, Selden Division at Bridgeville, Pa. Rapid public acceptance of new plastics, enamels, and lacquers caused the production curve to climb. Adequate electrical distribution became increasingly important. At the original load center, close clearances limited expansion and required a complicated bus structure.

A new load center was installed. The transformers and primary and secondary bus connections were located outdoors but protected from the weather. A dead-front panel now allows plenty of room for future expansion. Top and bottom mounting of buses permits sectionalization for making additions without interruption. The buses are sufficiently heavy to carry full load and stiff enough to prevent buckling due to temperature changes. An electric heater is used to prevent condensation in cold weather. The new load center is shown in an accompanying illustration on a preceding page.

5. Convert Space for Production Purposes

The electrical maintenance man's work takes him to all parts of the plant and thus he is enabled to have a good over-all viewpoint of existing conditions. Therefore when additional production area is required he can make suggestions on how to utilize space better. It may be done by moving some machines, benches or work tables closer to each other, by clearing a room or a section of the basement used for storage, by re-arrangement and possibly increased use of bins and shelves in the stock room, by consolidating offices, by moving a very small department or

[Continued on Page 54]



***AIR CIRCULATING FANS** (in circular frame) help cool dies, wire, and wire-drawing blocks on continuous wire-drawing machines at Union Wire Rope Co., Kansas City, Mo.*

OUT OF THE DANGER ZONE!

Outdoors, a safe distance away from the hazardous area of a Pennsylvania polymerization plant, is this "3C" Variable Speed Starter, installed in a special cabinet.

The enclosure is ventilated top and bottom with built-in grille work; the doors are gasketed; the top of the cabinet has a special hood or roof which successfully sheds water, thus making a weathertight job. It's more than a controller enclosure—it's a Control Room—entirely by itself in a *non-hazardous area*. The cabinet door must be opened to operate the equipment, but a locking device prevents tampering by unauthorized persons.

The "3C" control is for a 40 H. P., 220 V., 30 Phase, 60 Cycle Explosion Proof Variable Speed Wound Rotor Induction Motor, which drives a vertical triplex close-clearance pump having 1,100 pounds per sq. in. discharge pressure.

This "3C" installation, readily accessible to the operator, saved the additional cost of explosion proof apparatus and provides effective control and safety.

"3C" engineers will gladly consult with you on electrical control problems in hazardous or safe areas.

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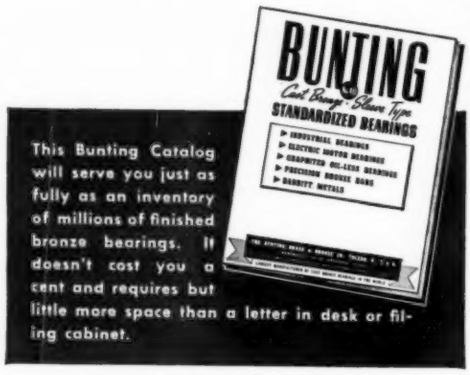

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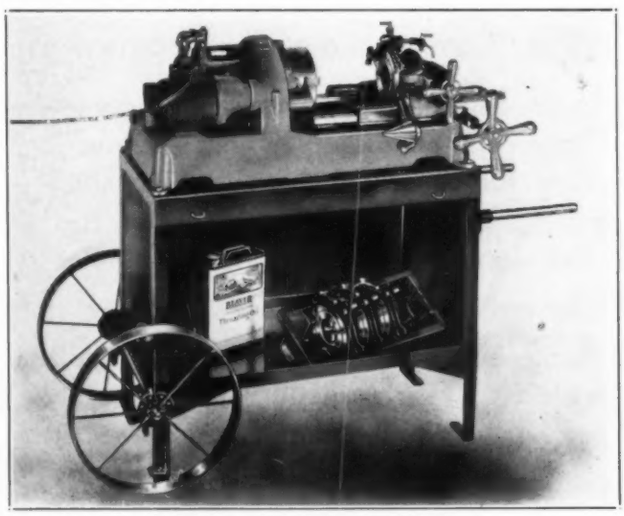

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⅛ to 2-inch Pipe and Bolt Machine

For ⅛ to 2-inch pipe—¼ to 1½-inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.
Write for Bulletin B.

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Highest Quality • WARREN, OHIO • *For 40 Years*
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possibly a couple of operations to a location of an appropriate area.

When the space to be converted for production purposes is being considered, the maintenance man will have a knowledge of the conversion and utilization requirements. He must consider ventilation which involves fans or unit heaters and coolers; use of fluorescent lamps with a degree of color suitable for the operations; method of power distribution with provision for adequate branch circuit taps or convenience outlets of heavy-duty type.

One company had some additional packing operations and decided that a small plant basement could be utilized. But the place was too damp for the employees and the condition had to be corrected. The problem was solved by using an 18-in. motor-driven fan. An 18-in. duct leading to the floor above was brought down to within 6-in. of the floor, and the fan installed in the discharge of the duct. Cold damp air on the floor was quickly and easily drawn off. Within a few hours the basement became a satisfactory workroom.

Incidentally, this method of "air conditioning" is applicable for out-of-the-way corners and spaces which can be converted to use.

6. Additional Provisions for Adequate Capacity

In addition to the foregoing, there are various other methods for providing adequate capacity to meet increased demands. The following list itemizes some other important methods—

A. Provide adequate ventilation for electric apparatus, devices, and wiring, so that rated load can be carried without exceeding the specified temperature rise.

B. Modernize drives by using a gear-motor for low-speed operation or a high-speed motor with an adjustable speed reducer to regulate speed of production machine.

C. Increase the amount of illumination by cleaning lamps and reflectors, or using larger lamps. Fluorescent lamps have a high lumen per watt output. Silvered-bowl incandescent lamps eliminate glare.

D. Increase the number of conductors in concealed conduits by making replacement with conductors having latest types of insulation and smaller outside diameter.

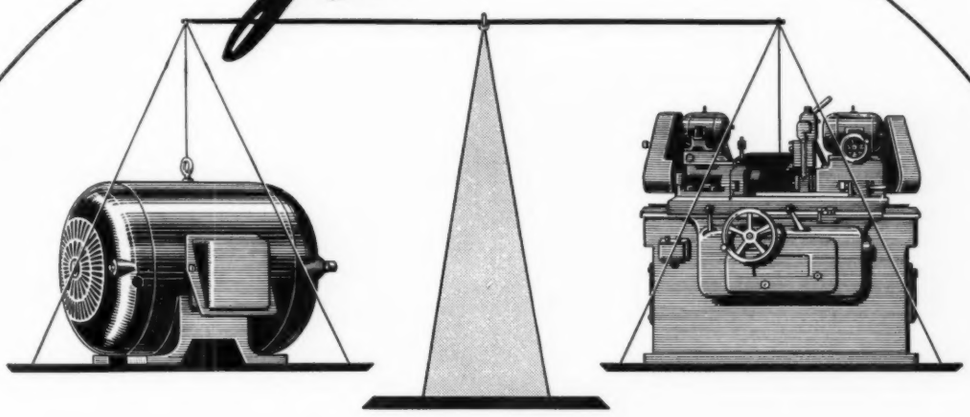
E. Increase the number of circuits at the distribution center by using a panel with modern type of breakers.

A Correction

Data on Electrical Thawing of Frozen Water Pipes was given in the Maintenance Guide Sheet, page 41, of the January issue.

The size of cable, No. 3 TBWP, was erroneously given for the voltage drop in the leads for both the 200-amp.

CENTURY *Job Selected* MOTORS



Balance the Job!

Peak performance is best assured when every motor factor is weighed with respect to each job factor. Here are a few examples:

Typical Job Requirements	*Century Motor Advantages*
• For precision production from machine tools	• Century Motors are unusually free from vibration
• For shock loads, such as punch presses and shears	• Century Motors with high slip (slows down with peak loads) characteristics to cushion the shocks
• For hard-to-start loads	• Century Motors with high starting torque and low starting current
• For chemically charged atmospheres	• Century *special* insulations protect the windings against *abnormal* acid, oil and alkali fume charged atmospheres
• For dust charged atmospheres	• Century Totally Enclosed Fan Cooled Motors protect windings against *abnormal* metallic or abrasive dust charged atmospheres

To get peak performance from your production equipment, the motor should be selected so as to best fit the demands of its particular job and surrounding conditions. That's what we mean when we say Century Job Selected Motors balance the machines they drive — the motor characteristics may be engineered to meet the requirements of practically any industrial application.

Whatever the requirements of your machines or your products, Century Job Selected Motors may well help save production time and step up performance too. Century's wide diversification of motor types, kinds, and sizes, up to 600 horsepower, makes proper motor selection an easy task for the Century Motor Specialist. Why not call him in today?

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these special Data Sheets on Century Motors and their application.

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Repulsion Start Induction Motors	938A
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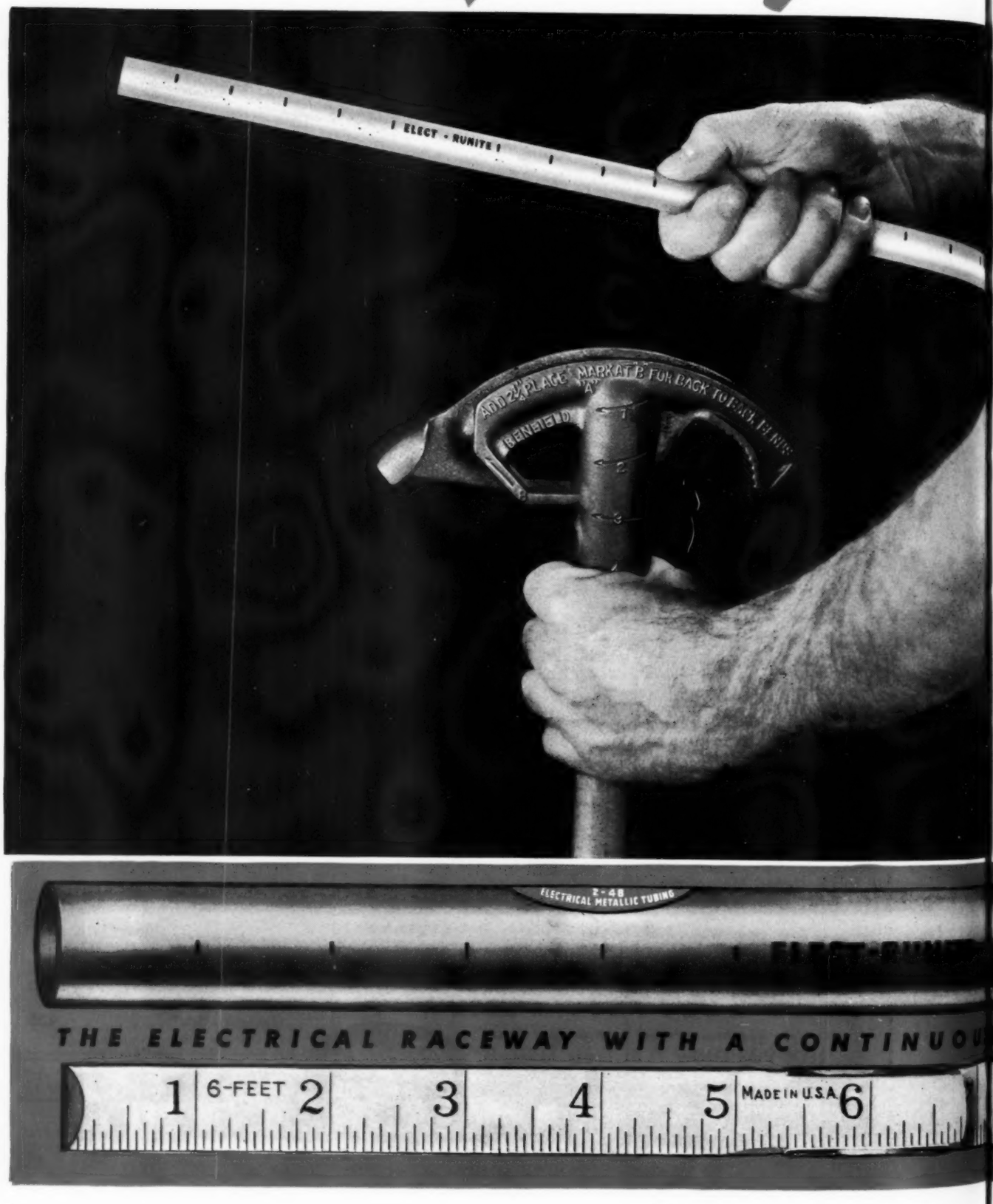
ELECT - RUNITE
ADD 2¼" PLACE MARK AT B FOR BACK TO BACK BENDS
BENDFIELD
2-48
ELECTRICAL METALLIC TUBING
THE ELECTRICAL RACEWAY WITH A CONTINUOU
1
6-FEET
2
3
4
5
MADE IN U.S.A.
6

foot-rule

—YOUR MARK FOR CUTTING OR BENDING ALREADY IS ON

"INCH-MARKED"

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ELECTRUNITE Steeltubes

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Don't throw your foot-rule away. You may have occasion to use it for other work—but you won't need it for marking off "Inch-Marked" ELECTRUNITE STEELTUBES. This easy-to-use electrical raceway has a continuous foot-rule printed right on the tubing along the entire length.

At every inch is a clear, accurate mark—at every foot is a number designating the length from the original end. Thus, when a cut or bend is to be made, you merely count off the distance —and there's your mark.

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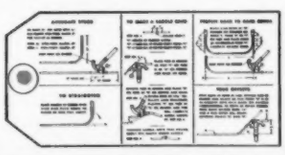
Add to these exclusive advantages the light weight, freedom from threads, uniform ductility and knurled inside surface that reduces wire pulling effort—and you'll realize why "Inch-Marked" ELECTRUNITE STEELTUBES is the easiest-to-use rigid steel raceway in the world. Try it on your next wiring job—exposed, concealed or in concrete—and you'll KNOW how easy it is to use and how it can help you on the job. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.

LOOK FOR THIS LABEL AND BENDING INSTRUCTION TAG

When you buy electrical metallic tubing, look for this label and the "inch-marking." They identify the only tubing with the many advantages of ELECTRUNITE STEELTUBES. *Look, too, for the bending tag on every bundle.*



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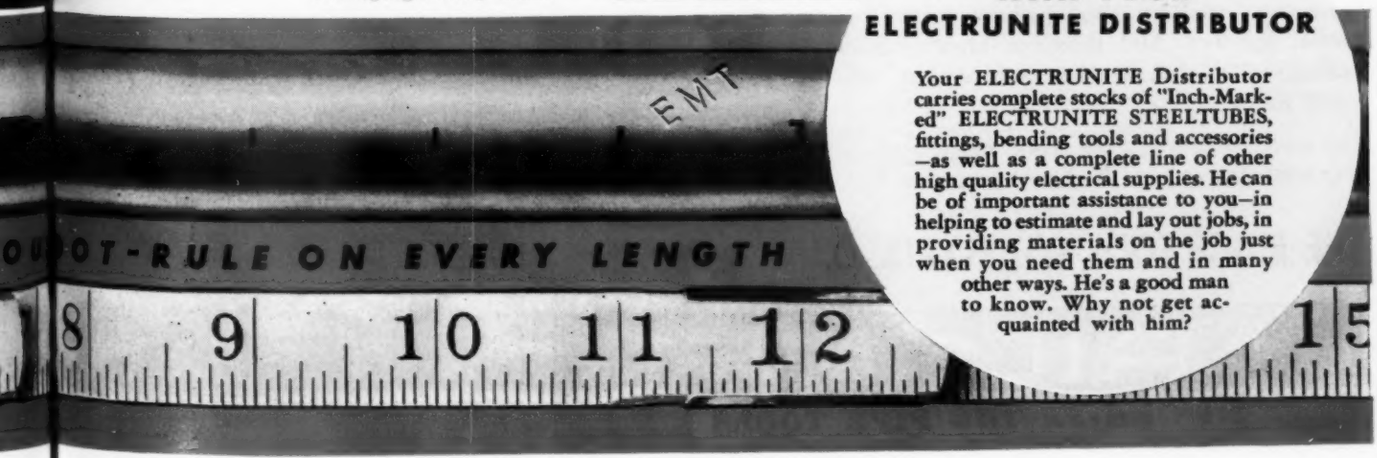
REPUBLIC STEEL

GET ACQUAINTED WITH YOUR ELECTRUNITE DISTRIBUTOR

Your ELECTRUNITE Distributor carries complete stocks of "Inch-Marked" ELECTRUNITE STEELTUBES, fittings, bending tools and accessories —as well as a complete line of other high quality electrical supplies. He can be of important assistance to you—in helping to estimate and lay out jobs, in providing materials on the job just when you need them and in many other ways. He's a good man to know. Why not get acquainted with him?



Do the Big 1941 Job with Less Man-Killing Effort

RIDGID Heavy-Duty Cutter Wheel.

Cut Pipe and Conduit Easier and Faster with the Work-Saver RIDGID

RIDGID thin blade cutter wheel, tool steel forged and assembled in steel-bushed hub.

RIDGID Heavy-Duty Pipe Cutter.

The Defense cry is for *more* Speed! You can get it and still protect your men—with RIDGID Pipe Tools, long famous as time and labor savers —like this remarkable cutter.

That thin forged blade wheel rolls easily through pipe and conduit with the least effort. Cuts clean, practically no burr. More cuts per wheel, less changing, lower cost. Powerful well-balanced frames, easy twirling to size. Standard and heavy-duty models; also 4-wheel cutter with special handle. And there's a highly efficient RIDGID thin wall conduit and tubing cutter you'll like.

Cut more conduit but cut work and expense. . . Buy RIDGIDs at your Supply House, today!

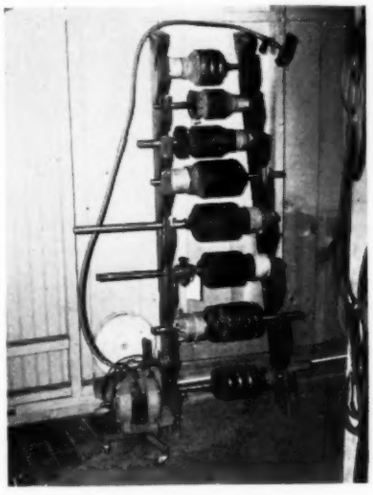
THE RIDGE TOOL CO., ELYRIA, O.

RIDGID
WORK-SAVING PIPE TOOLS

and 300-amp. thawing currents. The size of the cable should be No. 1/0 TBWP. Both column heads should read "Drop in No. 1/0 TBWP Leads, (volts)". There is no change for the size of cable and respective column head for 100-amp. thawing current.

Armature Rack

Spare armatures are necessary to prevent long shutdowns when motors fail. A simple wood rack to hold them takes



WOOD RACK requires small floor space and keeps spare armatures accessible for emergencies.

little floor space and permits easy access and identification, in the maintenance shop of a large cafeteria operator in New York City.

Triple Voltage Connection for Compressor Motors

By means of a special but simple arrangement of the stator windings, a 3-phase compressor motor can be readily reconnected at the terminal board for any one of three voltages, such as 199, 208, and 220 volts.

For a given line voltage, some additional adjustment of the starting torque and starting current is possible for meeting special conditions.

The use of this connection results in greater flexibility in making installations and a material decrease in the number of stock motors necessary for different applications in commercial refrigeration and air conditioning.

Regardless of the connection used, all of the stator winding is used all of the time and, thus, excellent operating characteristics are maintained. These General Electric compressor motors also incorporate the new Valv-amp. rotor and are available in sizes through 200 hp.

Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00

IN everybody's day's work, questions come up where we would like to check with some one else's experience. But we don't know who to ask. We don't know who will just happen to have the answer. This happens to everybody.

It has been suggested by several men interested in industrial uses of electricity, that we set up a READER'S QUIZ Department in this section of this paper where such questions may be asked and exposed to thousands of other readers who may have run into similar conditions and found the answers. It is a good idea —and no sooner said than done.

Beginning next month, therefore, we will run such a READER'S QUIZ—listing each month questions we have received from electrical maintenance engineers and industrial electrical contractors. The answers we receive from other readers will be published in following issues. And from our large number of readers, who are interested in such questions, we expect to receive answers that are interesting, practical and helpful.

We will sign the questions with the initials of the asker. We will sign the answers as published the same way. Also, we will forward by mail to the asker of the question copies of all answers to his problems as soon as they are received. These mailed answers will be confidential and can therefore carry the answerer's name, city and the name of his company. For it will be interesting for the asker to know what kind of a factory or experience the writer of an answer is associated with.

What kind of questions do we want?

Why any kind.

It may concern the hooking up of a motor and its control—some problem of commutation—or where to place a capacitor to get certain results in power factor correction—or lighting for an unusual type of machine grouping—or an oiling schedule for automatic machinery with built-in motors—or some puzzle on hazardous conditions and the use of explosion proof equipment. Whatever it be—when it pops up send the question in. We will ask the other men, who may be able to help with this one to give their advice.

For every question and for every answer published we will pay $5.00. This won't buy anybody a large double jointed steam yacht. But it will make it worthwhile to give an evening once in a while to answering five or six of the questions that may appeal to you. And if you spend it on good old Honest Long Cut pipe tobacco, it will make almost as much smoke as a yacht—if you put your heart in it. But we needn't worry about that.

So look for the READER'S QUIZ—next month. You'll find it clearly marked here in the Industrial Electrification Section. We will make it just as interesting as the readers want it, by publishing their own questions and replies. Of course, we reserve the right to select the questions and answers that are published. But it is expected that we will present most of them. We will be glad to give whatever space it requires.

Avoid FREQUENT REPLACEMENT

JOHNSON ELECTRIC MOTOR BEARINGS

● The life of an Electric Motor Bearing is determined by the alloy of the bronze. Such operating factors as high speeds, overloads, grit and dust must be provided for. Johnson Bearings are cast in a special high lead bronze that guarantees the maximum in performance. Try a pair on your next overhaul. There is no delay in shipping — and the bearings are fully machined, ready for immediate installation.

Free — a seventy-six page catalogue that lists, illustrates and describes the most complete bearing service available. Write for a copy—Today.

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Sleeve BEARING HEADQUARTERS
490 S. MILL STREET • NEW CASTLE, PA.

SAVE TIME INSTALLING EXPANSION ANCHORS

Drill Clean, Accurate Holes 50% Faster In Concrete

When you drill holes with Carboloy Masonry Drill-Points you get a clean, accurate hole that exactly fits expansion anchors. No cutting and trying. No loose, wobbling holes.

Carboloy Drills hold size and stay sharp up to 50 times longer than ordinary steel. This amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, brick, porcelain, etc., 50%—75% faster. Eliminates slow, monotonous hand chiseling. Doesn't splinter fragile work. Quieter.

No special equipment needed. Use in any rotary drill. Send for leaflet.

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DETROIT, MICHIGAN

Carboloy Co., Inc.
11135 E. 8 Mile Rd., Detroit
Send free leaflet on Carboloy Masonry Drill-Points, for drilling concrete 50% faster.

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takes pleasure in announcing their appointment as distributor for the
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Write Today for Catalog to Any of the Following:

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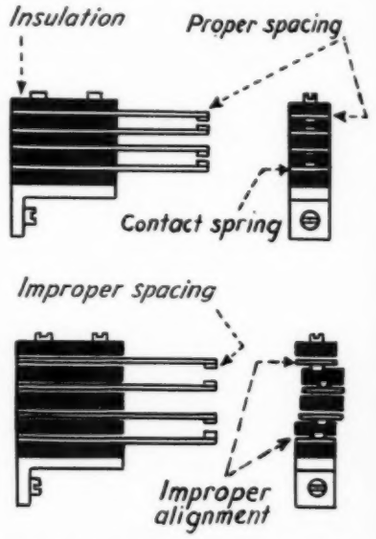
Stocks Carried at All These Points

INSULATION AND WIRES INCORPORATED
2127 Pine St. St. Louis, Mo.

Multi-contact Devices

Any number of devices, using multi-contact springs, are found in signalling systems, such as telephone jacks, hook-switches, relays, timing devices, push buttons, switches. At times, their circuits become troublesome. Very often the contact springs require adjustment, but it is not always necessary to bend the springs in order to correct the trouble.

A hasty examination sometimes seems to indicate that the contact springs are making satisfactory connection. A closer examination however, reveals that



CONTACT TROUBLE—How trouble developes on signal system due to improper spacing of contact devices.

the space between contacts has actually increased and the contact between springs is faulty.

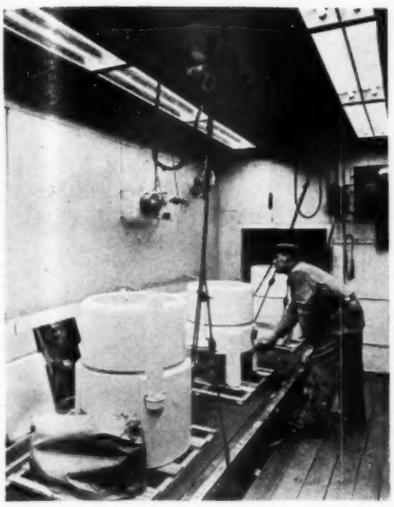
This difficulty is not always caused by the incorrect adjustment of the contact springs themselves. Instead, the increased spacing is due to shrinkage of insulation and the loosening of the mounting screws. When this trouble is obvious, the spring "pile-up" must be lined up and the mounting screws must be tightened.

The sketch shows how improper spacing and alignment of contact springs causes poor contacting surfaces. Top indicates the correct adjustment. Bottom indicates the incorrect adjustment.

Fluorescent Lamps Make Inspection Easier

Relighting with fluorescent luminaires has made a striking improvement in illumination for inspection booths of the Apex Electric and Manufacturing Co., Cleveland.

Six twin-lamp Westinghouse lumin-



***INSPECTION BOOTH** provided with 100 foot-candles of even, glareless, and cool illumination, after installation of twelve 40-watt fluorescent lamps.*

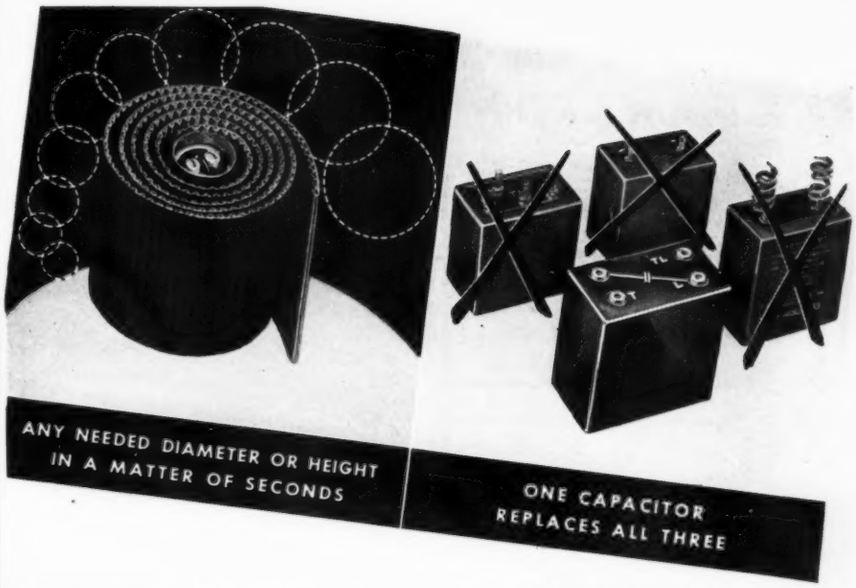
***BEFORE RELIGHTING**—The same inspection booth had 50 foot-candles of illumination provided by six 200-watt daylight incandescent lamps.*

aires, each having two 48-in., 40-watt fluorescent lamps, provide 100 foot-candles of glareless, cool illumination.

Especially noticeable is the absence of shadows in any form on the product being inspected, and the evenness of illumination over the entire booth. Direct and reflected glare has been eliminated and radiant heat no longer is annoying to the workers.

Fluorescent lamps have high efficiencies and provide illumination of important areas without increasing power costs.

Previously six reflectors, each equipped with a 200-watt daylight incandescent lamp, provided about 50 foot-candles of illumination on the inspection line. Lamp brightness of these units was high, causing annoying direct and reflected glare; and the amount of heat radiated by them caused discomfort.



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***Universal* AC CAPACITORS**

Stop making double trips on Motor Start Capacitor Replacements. A representative line of Mallory Universal AC Capacitors will cover every replacement need and reduce your inventory investment from one-half to two-thirds.

Round types MSU are encased in the smallest metal container possible. Used with the specially developed "size adjuster" you can work to a maximum diameter of 3" and a maximum height of 4¾". Simply trim to the required size for a perfect fit.

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Write today for Catalog M-801 giving complete details and replacement recommendations.

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PAINE
EXPANSION
ANCHORS

TAKE THE RISK OUT OF INSTALLATION IN SOLID MATERIAL

Fig. 910

PAINE LEAD EXPANSION ANCHORS

These anchors grip concrete, stone, marble, tile, etc., firmly preventing movement in any direction. They are rust-proof, vibration resistant and will withstand tightening pressure.

Fig. 910 (above) Bolt and Nut Type is cadmium plated. Fins on bolt head grip lead sleeve providing lock-washer action.

Fig. 900 (right) Machine Screw Type has brass countersunk cone for easy starting of screw and lead expansion sleeve.

Fig. 900

PAINE SINGLE MACHINE BOLT SHIELDS

A dependable and durable anchor that gives strong bearing at all points when expanded. Has powerful interlocking construction that makes it practically one-piece. Made for all standard Machine Bolts.

Fig. 970

PAINE MALLEABLE LAG SCREW SHIELDS

Easily, quickly and permanently set into holes made in concrete. Shields have deep accurate threads designed to fit any square or flattened head lag screw. Lag screws never strip or freeze.

Fig. 980

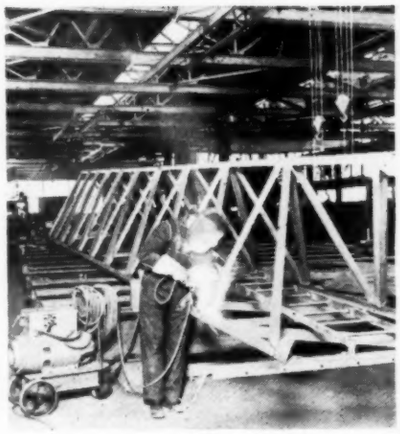
Ask your Supply House Today for PAINE Lead Anchors and Write for Complete Catalog of Anchoring Devices.

PAINE

THE PAINE CO.

2961 CARROLL AVE. CHICAGO, ILL.

New York Warehouse & Sales: 48 Warren St.



ALL-WELDED floodlight tower being fabricated in the shop of the Mississippi Valley Structural Steel Co. This method of construction means a saving of both time and money for the company. A General Electric 150-amp. portable arc welder and W-20 electrodes were used. The structure is one of 64- and 80-ft. towers for Chicago playgrounds.

Condenser Ventilated with Electrically Cleaned Air

Electrostatic cleaning is being used for ventilating air for a recently installed 20,000-kva., 13,800-volt, 720-r.p.m., synchronous condenser at the Gorge Steam Plant of the Ohio Edison Company.

More than 85 per cent of all dirt particles are removed from the air by the 56 Precipitron cells before circulating through the windings at the rate of 40,000 cubic feet a minute. It is estimated that in a year the air cleaners will have collected between 50 and 75 bushels of air-borne dirt which might otherwise have been blown into the machine.

In the Precipitron cells, dirt is first charged with electrons as the particles pass fine platinum wires, about the size of human hair, which are charged to 10,000 volts. As the air continues between a series of parallel plates, the dirt is pulled out by a 5,000-volt charge on the plates; just as a magnet draws up iron filings. After depositing its dirt in the cleaner, the air goes through the windings of the machine where it picks up heat. The hot air is vented out of doors in summer, and is released inside the power station to heat the room in winter.

Speed Measured Electrically

One design of an electric tachometer is a combination of a d.c. generator and a d.c. voltmeter calibrated in speed units. The d.c. generator usually has

Peerless MOTORS

USE Peerless Motors on replacement jobs. They are built to stand the gaff—to give long, trouble-free service—to stand up under that extra load which a motor must deliver at times. Use them, too, on all initial installations. They do much to build up customer good will—to contribute towards your reputation as a shop that does dependable work which stands up in service. Write for literature, prices and discounts.

Quick Deliveries

PEERLESS EXHAUST FANS

Help Speed-Up Production

TODAY'S need in industry for maximum production demands adequate ventilation to keep workmen fresh, keen and alert. Investigate the effectiveness and dependability of Peerless Exhaust Fans for this purpose. You can make money with them. Write for the Peerless Exhaust Fan Bulletin.

THE Peerless ELECTRIC CO.
WARREN, OHIO

an armature rotating in a permanent magnet field. The output voltage is proportional to the speed.

Tachometers can be applied to many jobs, such as measuring speed of motors and of conveyors. The scales can be calibrated in any unit desired, such as "revolutions per minute," "miles per hour," "feet per minute," or "baking time in minutes."

These electrical instruments for speed measurement have several advantages:

1—No mechanical connection between drive and indicator.

2—Indicator can be remote from device being measured.

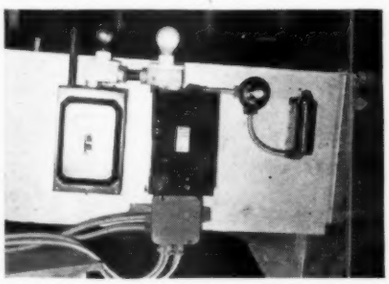
3—More than one indicator can be used with only one generator (magneto).

4—No service required.

Convection Heaters Reduce Drying Time for Mirrors

Difficulty was experienced in drying silver coatings before backings were applied to mirrors at the plant of the George Behm and Sons Co., Dayton, Ohio. Silver coating operations were carried on in the basement. Humidity was a handicap, especially during the summer months.

The unsatisfactory drying was overcome by the use of two convection heaters. Both heaters were placed at one end of a hood which covered one-half



CONTROL EQUIPMENT for drying mirrors. (Left to right) Main line switch, magnetic contactor, fan speed switch and temperature control. Lights are indicators for energized circuits to fans and heating elements.

of the drying table. Warm air is blown through the enclosed space. The temperature in the enclosure is maintained at 105° F. by thermostatic control.

Each heater has a 3 kw. heating element and a motor-driven fan. Either heater can be operated independently of the other. The fans can be operated independently of the heating elements.

Glass for the mirrors is laid flat on frames with casters. After the silver coating is applied, the glass is pushed into the enclosure and the heaters put in operation.

FAST CAPACITORS

FOR EVERY INDUSTRIAL NEED

FAST Dust Tight CAPACITORS are easy to install.

They are complete with conduit box, knockouts, mounting brackets, soldering lugs, fuses and discharge resistors.

Investigate the economy of a FAST CAPACITOR installation.

Write for catalogue #20 for a listing of industrial capacitors.

JOHN E. FAST & CO.

CAPACITOR SPECIALISTS FOR 21 YEARS

3119 N. CRAWFORD AVE. CHICAGO, ILLINOIS

No Unsightly Entrance Cable

The architect and electrical contractor who co-operated in the building of this attractive home were both forward-looking people and they understood the value of attractive surroundings. It would have been too bad to spoil the beauty of this house by installing the usual unsightly overhead entrance cable from pole line to house. The installation of Simplex-ANHYDREX insulated underground service cable enhanced the natural loveliness of these surroundings.

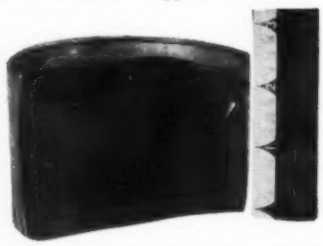
When you have either a new or rewiring job use Simplex-ANHYDREX underground service cables. You will have a neater job and you will insure constant trouble-free operation for the owner.

SIMPLEX WIRE & CABLE CO.

79 Sidney Street, Cambridge, Mass.

Modern Synthetic Gum Base Varnish Solves Deep Drying Problems

Newark, N. J.—The John C. Dolph Company announces a new insulating varnish known as SYNTHITE PG-1 Clear Baking Varnish that solves many problems that have confronted electrical men for many years. Now it is possible to obtain thorough drying even in the deepest winding. If sufficient baking time is allowed, SYNTHITE PG-1 Clear Baking Varnish will harden throughout regardless of the amount of varnish inside the windings of coils. To demonstrate the deep drying characteristics of this synthetic gum base varnish, a one pound can was filled with varnish. It was baked for an extended period and then the can was cut in half. As can be seen from the illustration, the varnish was solid throughout. Even at a depth of two inches, there was no wet varnish or trapped solvents.



As a result of this demonstration, widespread interest has been aroused and many engineers have adopted this varnish for deep wound coils. Additional data regarding SYNTHITE PG-1 Clear Baking Varnish may be obtained by writing to the JOHN C. DOLPH CO., for a SYNTHITE PG-1 specification sheet.

Special Lacquer Aids Lead Identification

New York, N. Y.—A prominent shipyard found that the clear insulating varnish they were using made lead identification difficult — blues became green causing considerable confusion. After changing to DOLPH'S #3-C Clear Lacquer, this trouble disappeared. The colored leads were readily identified through the lacquer film.

Maintenance Men, Repair Shops Can Obtain Free Dipping Tank

Newark, N. J.—A new folder describing CHINALAK Black Baking Varnish has just been issued by the John C. Dolph Company. As well as describing the physical characteristics of this remarkable black baking varnish, this new folder gives valuable data regarding its use and application. Preheating and prebaking are among the subjects discussed. In addition, a special offer enables repair shops, industrial plants, etc., to obtain a special removable head drum that can be used as a dipping tank free of charge. To obtain this folder, simply write to the JOHN C. DOLPH COMPANY, 168A Emmett Street, Newark, N. J.

With this method of drying, the company has been able to—

(1) Improve the quality of the product by eliminating trapped moisture.

(2) Save considerable time on rush orders because drying time is reduced to 15 minutes.

(3) Increase production because of reduced drying time.

Safety Codes for Dust Explosion Prevention

Recommendations for safe practices designed to eliminate or reduce dust explosion hazard have been compiled and developed as safety codes. A number of the codes have been approved as American Standard.

In order that the electrical maintenance man will have an idea of the latest practices for dust explosion control and prevention in industrial plants, the 11 standards are given in the following list. They can be obtained at a nominal price from American Standards Association, 29 West 39th St., New York. The safety codes (ASA publication numbers in parenthesis) are:

1—Aluminum Bronze Powder, Prevention of Dust Explosions in the Manufacture of, (Z12.11—1940).

2—Coal Pneumatic Cleaning Plants, Prevention of Dust Explosions in, (Z12.7—1940).

3—Flour and Feed Mills, Prevention of Dust Explosions in (Z12.3—1940).

4—Inert Gas for Fire and Explosion Prevention, Use of, (Z12.10—1940).

5—Pulverized Fuel Systems, Installation of, (Z12.1—1940).

6—Spice-Grinding Plants, Prevention of Dust Ignitions in (Z12.9—1940).

7—Starch Factories, Prevention of Dust Explosions in, (Z12.2—1940).

8—Sugar and Cocoa, Pulverizing Systems for, (Z12.6—1940).

9—Terminal Grain Elevators, Prevention of Dust Explosions in, (Z12.4—1940).

10—Wood Flour Manufacturing Establishments, Prevention of Dust Explosions in, (Z12.8—1940).

11—Woodworking Plants, Prevention of Dust Explosions in, (Z12.5—1940).

Other codes are being prepared, including one for sulphur grindings plants, and one for country (rural) grain elevators.

"Fundamental Principles for the Prevention of Dust Explosions in Industrial Plants" is the title of a general summary of recommendations by a committee of the American Standards Association. This committee release is intended as a guide in industrial plants which may have a dust explosion hazard in a manufacturing process but for which no specific code is available.

Handiest Helpmates for Small Motors . . .

such as
Refrigerators
Washers
Fans
Vacuum Cleaners
etc.

No interrupted motor service with Superior Carbon Brushes at hand. Made specifically for the exact motors to be served. Brush replacements you *know* are correct!

SCP

All That the Name Implies
SUPERIOR
CARBON PRODUCTS INC.
9115 George Ave., Cleveland, O.

Brushes for
FRACTIONAL HORSE POWER MOTORS

For Better Service—
INSTALL TRICO REG. U.S. PAT. OFF.

RENEWABLE FUSES
With the famous Powder-Packed Element

KLIPLOK CLAMPS
Lock fuses and clips together

KANTARK FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
The color tells the size

FUSE PULLERS
Pull and replace fuses safely

OILERS
Glass and Unbreakable types for every application. Stops guesswork - bearing failures- waste- idle machinery, etc.

WRITE FOR FOLDER No. 300

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

"So Mama's little aviator is stopping people from cleaning those silver alloy contacts!"

It is hard for some maintenance men to believe that they can install a starting switch . . . and never need to file or dress the contacts. But that is exactly what you can do with Allen-Bradley solenoid controls.

In fact, if you file or dress the double break, silver alloy contacts, you destroy much valuable contact life . . . and you may actually interfere with the faultless action of the switch.

If you want uninterrupted plant operation, do away with starter troubles and worries. Just specify Allen-Bradley solenoid motor starters . . . . . install 'em . . . forget 'em.

A-B

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Dust, Dirt, and Oxide Do Not Interfere with A-B Contact Performance

The silver oxide which may form on these double break contacts is just as good a conductor as the contact material itself. Therefore, the contacts do not heat up or cause trouble, even after long service. They are always in perfect operating condition.

Manual and Automatic Switches

Max. Rating—2 hp-220-440-550-600 volts

STARTING | MULTI-SPEED | REVERSING | MASTER | TRANSFER

FOR MANUAL CONTROL

Bulletin 353 Drum Switch showing handy terminals.

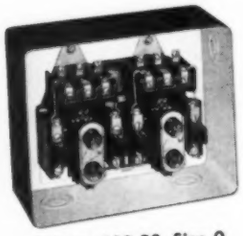
Drum switch designed for cavity mounting. Equipped with pistol grip handle.

Bulletin 353 Drum Switch showing enclosing cover and ball handle.

The new Bulletin 353 Drum Switches—Sizes 0 and 00—are the latest addition to the Allen-Bradley line. These drum switches have no rotating contact sectors or sliding finger contacts. The silver alloy contacts are snapped open and closed by cams on the vertical operating shaft.

Bulletin 353 Drum Switches are available for surface, cavity, or panel mounting. Four types of control handles—ball, pistol grip, knob, and standard—can be supplied.

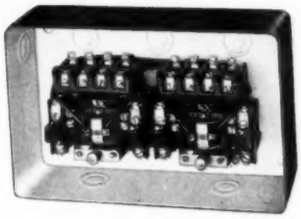
Bulletin 609 and 609-RS Starting and Reversing Switches are button-operated. Silver alloy contacts and overload breakers are standard features.



Bulletin 609-RS-Size 0 Reversing Switch showing operating buttons.

Bulletin 609-Size 0 Starting Switch.

FOR REMOTE CONTROL



Bulletin 715 Multi-Speed Motor Starter with overload relays.

Allen-Bradley small magnetic switches (Size 0) handle multi-speed and reversing motors up to 2 hp. There are no bearings, hinges, or jumpers. The double break, silver alloy contacts require no maintenance. Overload protection is provided.

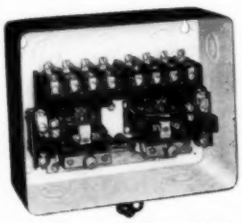
Bulletin 709—Size 0—Across-the-line Starting Switches for small single and polyphase motors.

Bulletin 715—Size 0—Multi-speed Starting Switches are available for separate-winding or consequent-pole motors—reversing and non-reversing.

Bulletin 705—Size 0—Reversing Switches are mechanically and electrically interlocked.

Write for Allen-Bradley starting switch bulletins.

Allen-Bradley Company, 1321 S. First Street
Milwaukee, Wisconsin



Bulletin 705 Reversing Switch for remote control of small reversing motors.

Bulletin 709-Size 0 Across-the-line Starter.

ALLEN-BRADLEY
MOTOR QUALITY CONTROL

Estimating

INSTALLING SQUARE RACEWAYS

Labor data on the installation of 4-inch square wireways was taken on a recent industrial job and analyzed for the unit factors entering this kind of work as a guide for future estimating and take off.

The work consisted of sub-feeder wireways extending from the power panel-boards over the machine area. Circuit taps were made in conduit down to the machines. In part of the area, the wireways were suspended from trusses, 18 feet above the floor, to a height of 13 feet. The rest of the area had roof purlins at a height of 15 feet from which the wireways were hung.

Work was handled from a rolling scaffold and holes drilled by electric drills. The hangers were made up ahead and fitted without cutting or alteration.

Materials used on the portion of the work studied were:

435 sections 5-ft. trough
44 end plates
14 T boxes
1 90-ft. elbow
4 pull boxes
6 small junction boxes
16 collars
2 6-in. nipples
85 45 deg. elbows
29 trough collars
440 hangers

The duct, in 5-foot lengths, is assembled by means of machine screws and nuts, eight to a joint. The hangers are bolted to the beams with two ¼–20 bolts and require two machine screws and nuts to connect to the trough hanger. Trough hangers fit like a gasket between sections and fasten with the duct section bolts.

In breaking down the labor cost figures we treated each fitting in terms of the number of terminals as all of the work involved takes place at and because of the terminal or joint.

Duct sections, nipples, end plates, elbows and small junction boxes all average one terminal each. Panel collars and trough collars require cutting the panel or duct and are correspondingly higher units. T boxes or junction boxes are figured at two terminals each.

The breakdown follows:

609 terminals	268 man hours, unit .44 ea.	
440 hangers	97 man hours, unit .22 ea.	
16 panel collars	11 man hours, unit .69 ea.	
29 duct collars	18 man hours, unit .52 ea.	
Total Time	394 man hours	

The costs above include supervision and lost time. It is important to note that the hanger unit comes out low for this type of operation. In figuring jobs where hangers must be fitted and installed from ladders this unit must be increased several times.

Data from A. C. Electric Co., Milwaukee, Wis.

SERVICE ENTRANCE AND METER CONNECTION

Bringing old service installations in flats and apartment buildings up to proper safety standards often runs higher in labor hours than ordinary estimating practice figures.

The following study on one such job was taken as a check on our estimating units and methods.

The job consisted of installing a new service entrance complete up to the branch circuit distribution centers. A 2-inch line with 3/0 wire was run to the first point of distribution. A sub-feeder of 3-1/0 wires was run to the second distribution center and 3 number 3's to the third. Meters, 6 at each distribution center, were removed temporarily and replaced.

The breakdown follows:

Installing 200 amp. main switch and 2 10 by 16 cutout boxes.....10.00 m.h.

Installing 16 two wire meter boxes and 2 three wire meter boxes including temporary work.....28.00 m.h.

Service riser and grounding, not including wire pulling and connections.....11.50 m.h.

Main feeder and sub-feeder, 90 foot run of 2 inch including hangers, ells and coupling but no wire.....17.50 m.h.

Sub-feeder, 90 foot run of 1¼ inch including hangers, ells and couplings but no wire 14.00 m.h.

Miscellaneous small conduit work including wire and connection.....14.00 m.h.

Wire installation
210 feet No. 3/0
180 feet No. 1/0
220 feet No. 3
15.00 m.h.

Total man hours for the job was 110 including lost time and superintending.

Data from Block Electric Co., Chicago, Ill.

***PROTECTION ESSENTIAL**—Under present day conditions, contractors must learn to protect themselves against labor shortage and material delivery delays when making estimates, according to Frank J. Bray, estimator and engineer for E. J. White Company, electrical contractor, Newark, N. J. Frank believes this necessary precaution will tend to stabilize quotations and gradually eliminate price-cutting tactics.*

LOST TIME FOR IDENTIFICATION

There are a number of small items which the contractor figuring electrical work in industrial plants today must consider when preparing his estimate. Outstanding among these is the item which should be included for time lost due to the identification routine employed by the various industrial plants in which the contractor does work.

In some plants the precaution taken may not be as strict as others, depending upon the importance of the industry to the national defense program. In all, however, some means of identification is used, whether it be just a badge with a number on it, or a badge with the picture of the workman as well as an identifying number. In all cases it means lost time which in normal times is not included in the labor estimate. And the larger the job, the more men there are on it and the greater the total amount of lost time. Then there is the inspection of the workman's tool and lunch boxes.

Another phase to be considered is

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EFFECTIVE SCREENING
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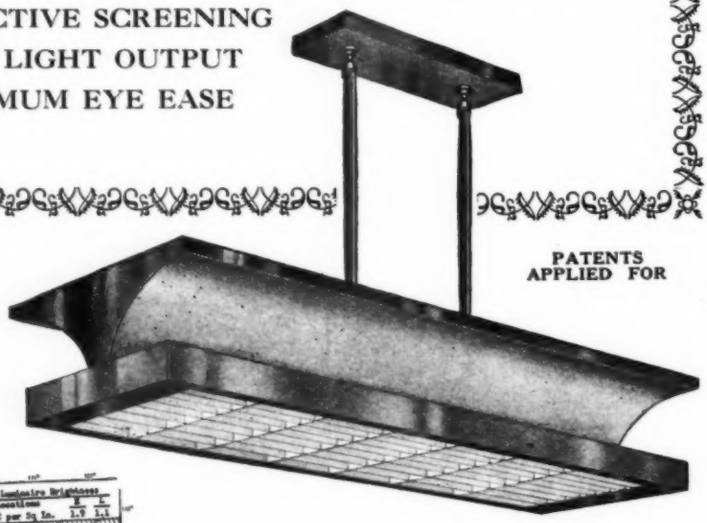
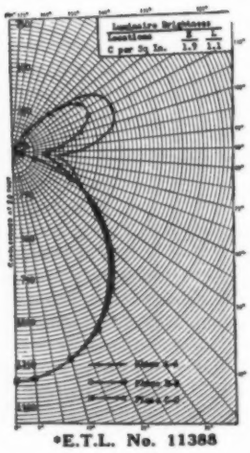


PATENTS APPLIED FOR



*E.T.L. No. 11388

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Illustrated is No. 3117. Can be supplied in both ceiling and suspension type. Other commercial and industrial fixtures also available.

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- Manicurist Lamps
- Music Lamps
- Mantel Reflector Lamps
- Band Stand Lamps
- Piano Lamps
- Library Lamps
- Bulletin Board Lamps
- Picture Reflector Lamps

Estimating

[FROM PAGE 67]

the necessity for inspecting the truck which delivers material to the job, both when entering and leaving the plant. In some plants a new ruling demands that all material be delivered at the plant receiving department platform rather than at the specific job site. This entails additional labor for transporting the material from this point to the job —an item which previous to the present crisis was nonexistent.

Still another point is that of labor priority for the defense industries. Men may be taken from a job in a non-defense industrial plant to be placed on a rush job for a defense plant. And the contractor is faced with the replacement of labor shifted in this manner. With the labor shortage now existing, this may not be an easy problem to solve and the contractor must make allowances in his estimate for such emergencies.

The lost time figures listed below are not average figures for any one part of the country or for a large number of jobs. They are compiled from the experience of one contractor on a few jobs. But they give an indication of some of the lost time which must be taken care of in present day estimating for defense work.

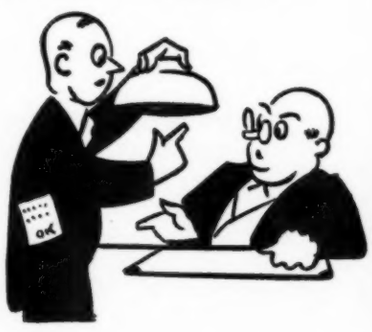
MECHANIC IDENTIFICATION—includes the time necessary for routine identification of the contractors' mechanics on the job, including taking the man's picture getting his case history and issuing him an identifying badge.
Total time per job (per man).... 1.0 m. h.

TRUCK INSPECTION—includes inspection of the job truck when it enters the plant and when it leaves.
Total time per trip..... 10 minutes

A conservative estimate of this contractor is that approximately two per cent of the total job cost should be added to cover lost time due to the restrictions mentioned above.

Data from E. J. White Co., Newark, N. J.

GLIMPSES OF OURSELVES



Summer's Saddest Moment : : : : BY WEBSTER

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SWELTERING JOE PUBLIC KNOWS WHAT HE WANTS TO KEEP HIMSELF COOL---- AND GETS STILL HOTTER AT TALK ABOUT SOMETHING "JUST AS GOOD"
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Your G-E distributor offers you a better deal than ever for 1941. A new, still faster-moving group of fans at lower prices. Free promotion that hits a new high in fan sales helps. The sweetest set-up for fan dealers you've heard in all your days. Hear the G-E story, and you'll agree it's a wise dealer who goes G-E.

Fan Sales Section, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

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1. A 10-color action ***Window Display*** that will stop 'em, hold 'em and sell 'em.
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3. Direct ***Mail Pieces*** that "get in the door" of homes, stores, offices.
4. Local newspaper ***Ad Mats*** that help you sell when your market is "hot."
5. Powerful ***National Newspaper Ads*** in over 175 key cities — run when you need them—in local hot weather.

GENERAL ELECTRIC

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Determination of Number of Circuits

Q. *"In example No. 2 Store Building on page 341 of the 1940 National Electrical Code, the determination of number of circuits for the 78 amp. of the 2-wire system seems to disagree with the requirements of article 2107.*

"According to article 2107 for continuous loads, the load shall not exceed 80 per cent of the branch circuit rating, that is, a 15 ampere branch circuit shall only carry 80 per cent of 15 or 12 amps. and a 25 amp. circuit 80 per cent of 25 or 20 amps. Therefore if the total load is 78 amps. two 25-amp. circuits would handle 40 amps. and two 15 amp. circuits 24 amps. leaving 14 amps. which would have to be added to these four above-mentioned circuits. In that case the 80 per cent loading would be exceeded.

"In the event of substituting the six 15-amp. circuits in place of the two 25-amp. and two 15-amp. circuits, the total of 78 amps. over the six circuits would give a load of 13 amps. per circuit. Is this small excess encouraged in place of adding an extra circuit? Also, with reference to the determination of the number of 3-wire circuits, there seems to be a small overloading permitted."—A.Z.

A. Example 2 on page 341 of the 1940 Code was given to show the mechanics involved in determining the number of circuits required for a given size occupancy. But while mention was made in the footnote to the example explaining that for a *store* occupancy the branch circuits must not be loaded beyond 80 per cent of the branch circuit rating, this factor of 80 per cent was not used in the example although the last sentence states that "in such installations the number of branch circuits shall be increased accordingly." There was no attempt, therefore, to encourage any excess loading on the circuits. It would have been much better had the example used the 80 per cent factor and thus have divided the total store lighting and the window loads by 12 amperes for the 15 ampere circuits and 16 amperes for the 20 ampere branch circuits. This would have then given the following results:—

For the general lighting load of 39 amperes on 115-230-volts the following number of circuits would be required,—

2–25 amp. 2-wire and 4–15 amp. 2-wire circuits; or

1–25 amp. 3-wire and 2-15 amp. 3-wire circuits; or

7–15 amp. 2-wire circuits; or

3–15 amp. 3-wire and 1–15 amp. 2-wire circuit.

For the special lighting load (show window) for the 26 amperes on 3-wire 115-230-volt or 52 amperes for 2-wire 115-volts the following circuits would be required,—

5–15 amp. 2-wire circuits; or

2–15 amp. 3-wire circuits and 1–15 amp. 2-wire circuit.

TRAVELER, C. L. Smith, Indianapolis electrical contractor on way to Cuban naval base job makes a quick stop-over in Jacksonville, Fla. to greet friends at the airport.

Switches

Q. *"Does the National Electrical Code require the use of switches in conjunction with fuses in panelboards serving branch circuits?"*—G.P.B.

A. The ruling on this is found in Section 2440 which requires that in circuits of more than 150 volts to ground, fuses, if accessible to other than qualified persons, shall be so arranged that they can be individually and independently disconnected from all sources of current before they can be touched. This means that there must be switches ahead of them.

While this is a requirement on circuits of more than 150 volts to ground it is, as stated in a fine print note following Section 2440, only a recommendation on circuits of less than 150 volts to ground where cartridge fuses are used.

Therefore, as our lighting circuits in general, are of less than 150 volts to ground, and must be less than 150 volts to ground in dwelling occupancies to comply with Section 2105, panelboards for general use do not have to have switches on them.

But where switches are provided on panelboards Section 3885 requires that the switches shall not be on the load side of the fuses.

This last provision (Section 3885) will no longer permit provisions being made for mounting switches on the panel to be connected up in the field as has previously been done, whereby the switch is connected on the load side of the fuse. But it does not prohibit the installation of a switch at a point away from the panel, which of course would be on the load side of the fuse.

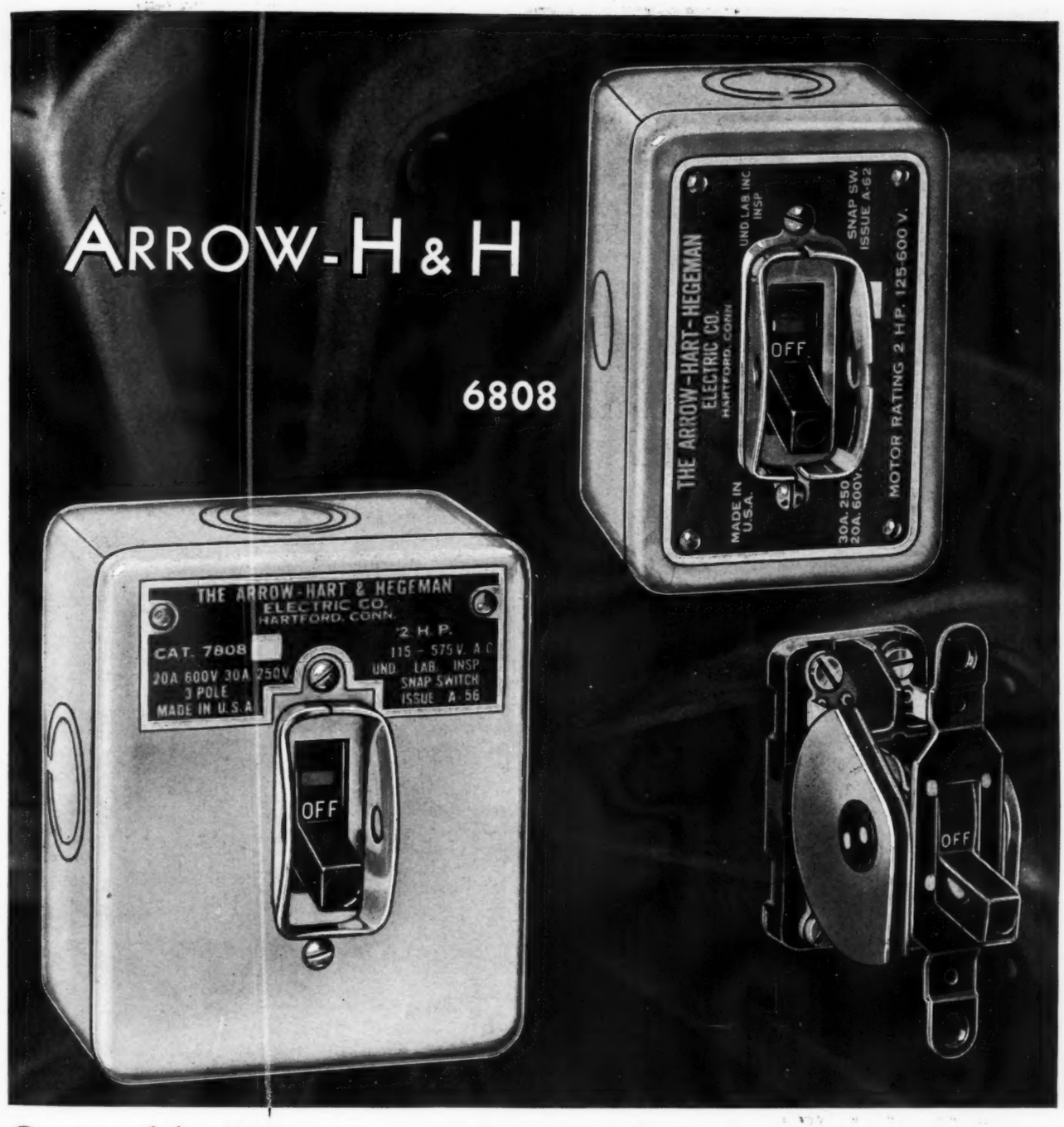
No. 12 Wire Residential Receptacle Circuit

The Power Company in and around our community will not install a meter unless the work is inspected and passed by an inspector, which in turn means that all work must be done as required by the N. E. C.

I am somewhat confused about the rule contained in the 1940 Code stating that Residential Wiring must consist of a No. 12 circuit supplying receptacles in kitchen, pantry, dining room and laundry.

I would appreciate very much if you answered my questions.

Q. *1. "If I used the ordinary receptacles in the No. 12 circuit installations, would it be permissible to use a 15 ampere fuse?"*—M.O.



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ACROSS-THE-LINE TYPE **Tumbler Switches, without overload protection. . . Give positive control for motors; especially suitable for oil burners, refrigerators, motor-driven machinery and lighting loads.**

These switches have rugged, durable mechanisms built to perform with the sturdy integrity characteristic of Arrow-H & H Lines. Bakelite arc snuffers increase breaking capacity; kick-off release mechanically starts the switch blades in motion and prevents sticking; extra-heavy blades and contact jaws increase current-carrying capacity.

Different styles of mounting are supplied for a wide range of machine-design requirements. Separate switch units are available for installations in switch housings built into motor-driven machinery.

No. 6808 (upper right) is a double-pole switch for single phase motors; No. 7808 (lower left) is 3-pole for 3-phase jobs. Also, the line includes 3-way, 4-pole and 2-speed reversing switches. All have horsepower ratings . . . Everything you may need in this line will be found in Motor Starting Switch Catalog No. 8-M — on request.

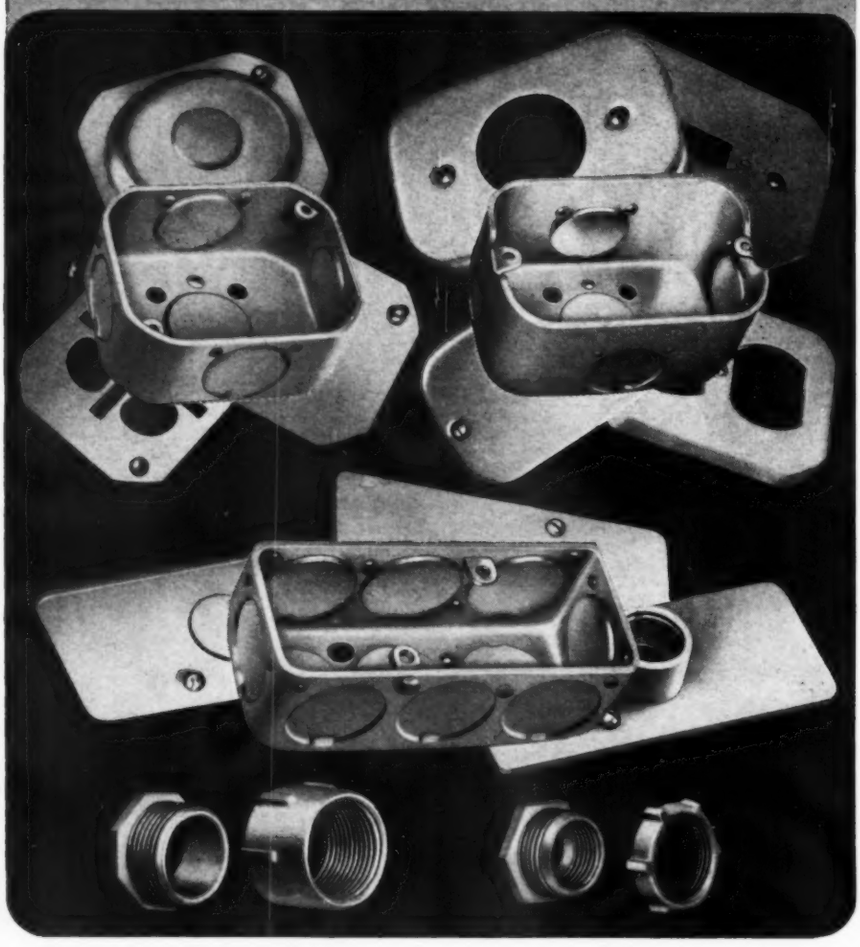
INDUSTRIAL CONTROL DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

G-E MULTILETS

(CONDUIT BOXES)

CAN BE USED IN 1001 DIFFERENT WAYS



SAVE WIRING TIME

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For further information about Multilets, the conduit boxes with a thousand uses, see the nearest G-E Merchandise Distributor or mail the coupon.

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Appliance and Merchandise Dept.
Bridgeport, Conn.

Sirs: Please send me information on Multilets.

Name.....

Address.....

City.....State.....

GENERAL ELECTRIC

Questions on the Code

[FROM PAGE 70]

A. 1. Yes, a 15 ampere fuse may be used on this circuit. Section 2109 does not require the use of a 20 ampere circuit but does require the use of a circuit with wire not smaller than No. 12.

If the receptacles on this circuit are rated at 15 amperes or more and are used to supply lampholders of the heavy duty type only, or appliances with ratings of not over 15 amperes each, a 20 ampere fuse may be used. Otherwise, and if receptacles of ratings of less than 15 amperes are used to supply medium-duty or smaller lampholders or appliances of 12-ampere ratings or less, the fuse must not exceed 15 amperes.

Q. *2. "If the computed load would be greater than 15 amps. and less than 20 amps. it would be necessary to use the 20 amp. fuse as protection for the circuit. What must be the rating of the receptacles in this case?"*
—M.O.

A. 2. If the computed load of a dwelling is between 15 and 20 amperes the Code requires the use of two branch circuits. One of these would have to be of No. 12 to supply only receptacle outlets in the kitchen, laundry, pantry, dining room and breakfast room to meet the requirement of Section 2109 and the other would supply the rest of the equipment.

The circuit of No. 12 wire could be fused at 15 amperes or 20 amperes according to the conditions mentioned in Answer No. 1 above. The other circuit would be fused at 15 amperes in order to take care of the ordinary lighting.

If the No. 12 wire circuit is fused at 20 amperes the receptacles must have ratings of not less than 15 amperes.

Comment: It must be kept in mind that where the number of circuits to be used in a dwelling is computed according to the "watts per square foot" as specified in Section 2108 paragraphs a, b and c, the number of outlets or the total connected load on the circuits is not limited or restricted. It is expected that the proper protective devices (fuses or circuit breakers) will keep the demand within proper limits. But where paragraph 2108d is used, then the number of outlets is limited.

The Lighting Company supplying current in the territory of our correspondent is to be commended in looking out for the safety of its consumers and their property by requiring inspection of all installations before connecting up the service.

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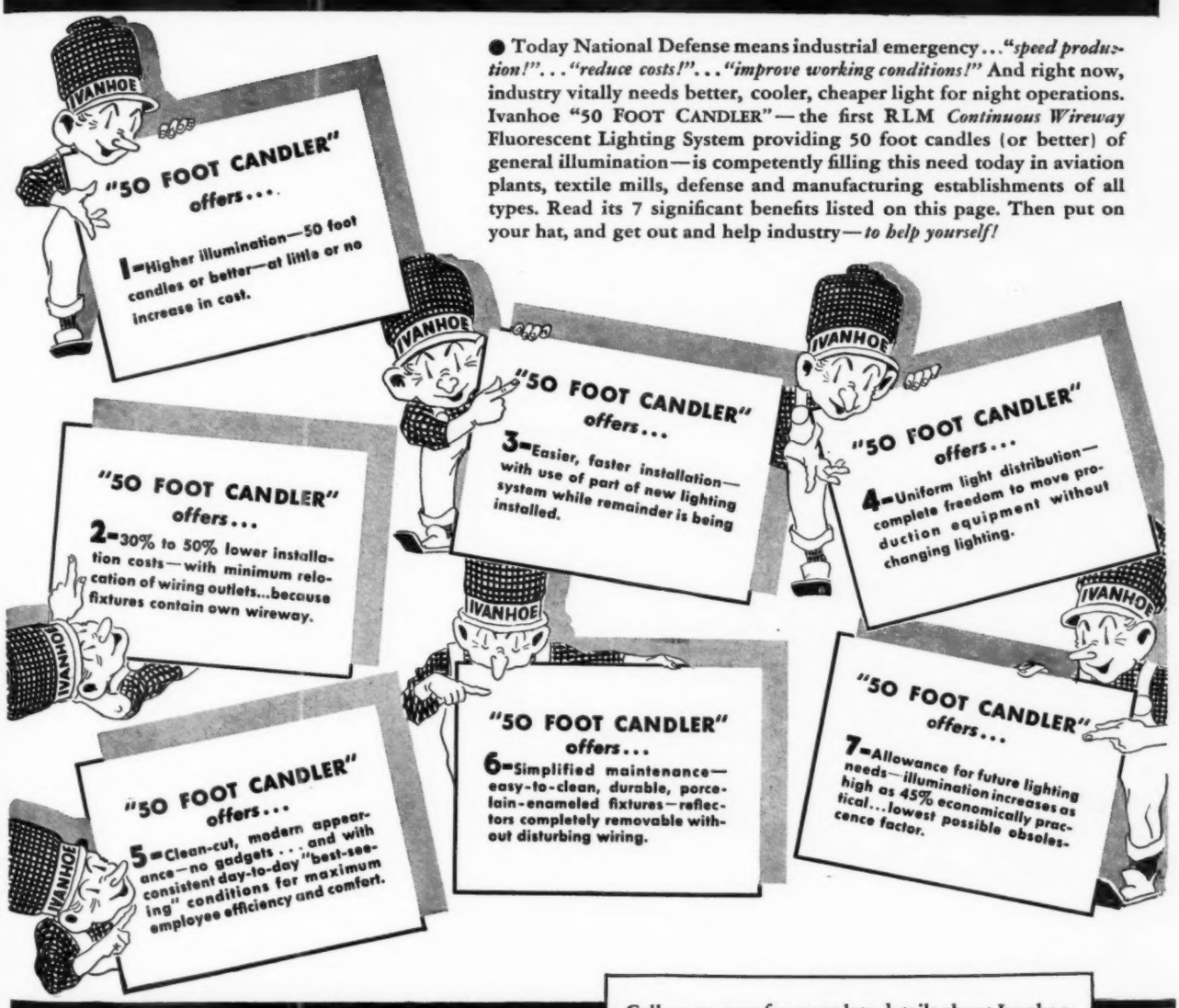
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"50 FOOT CANDLER" offers....
1—Higher illumination—50 foot candles or better—at little or no increase in cost.
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"50 FOOT CANDLER" offers...
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● Today National Defense means industrial emergency..."*speed production!*"..."*reduce costs!*"..."*improve working conditions!*" And right now, industry vitally needs better, cooler, cheaper light for night operations. Ivanhoe "50 FOOT CANDLER"—the first R.L.M *Continuous Wireway* Fluorescent Lighting System providing 50 foot candles (or better) of general illumination—is competently filling this need today in aviation plants, textile mills, defense and manufacturing establishments of all types. Read its 7 significant benefits listed on this page. Then put on your hat, and get out and help industry—*to help yourself!*

Call on us *now* for complete details about Ivanhoe Fluorescent "50 FOOT CANDLER"... case histories of people it has *saved* money for, *made* money for ... and the story of the Miller-Ivanhoe great new '41 promotion program. We're at your service any time, on any job, large or small. WRITE ...

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Below: Type CF, Single-phase, outdoor-type, air-cooled, general-purpose transformer.

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2 EASY TO INSTALL

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Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

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3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
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AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

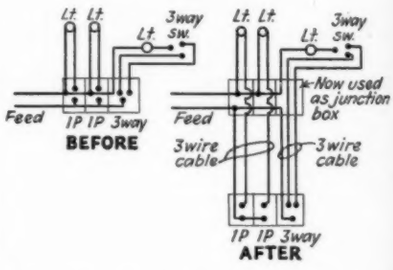
Questions on the Code

[FROM PAGE 72]

Switches

Q. *"I had an installation in which there were, in a 3 gang switch box, two single pole switches, each controlling a separate light, and a three way switch which controlled another light. I desired to locate these switches at another point using the original switch box as a junction box (exposed and accessible).*

"Can I use 3-wire armored cables in extending from the old to the new box, or must I use two 2-wire cables for the single pole switches?"—R.Z.



A. The three wire cables are satisfactory and comply with the Code. One three wire cable will take care of the 3 way switch and another 3 wire cable will take care of the two single pole switches and the Code will be satisfied in this manner of doing it.

It will not be necessary to use a separate 2 wire cable for each of the two single pole switches as with the 3 wire cable the current in one direction will be equal to the current in the opposite direction and there will therefore be no induction and Section 3052 of the Code will be satisfied.

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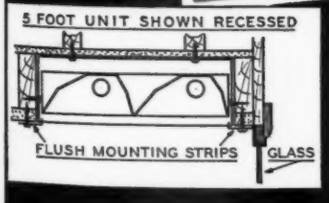

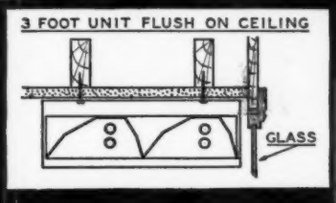

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NEW YORK CHICAGO TORONTO

In the News

NECA ELECTRICAL COMMITTEE VOTE UNCHANGED

The requests of the National Electrical Contractors Association and the U. S. Conference of Mayors for increased multiple representation on the Electrical Committee was rejected at a recent meeting of the Board of Directors of the National Fire Prevention Association, held at Atlantic City.

This action followed, as a matter of consistency, the adoption of a policy that the Electrical Committee should be limited to approximately its present size and that any further increase in multiple voting representation should be discouraged. This policy was not intended to limit the number of individuals who may be brought into the work of the Electrical Committee in a capacity other than as voting representatives.

This policy was recommended by the Committee on Technical Committee Procedure, following a conference in July at which all organizations now participating in the work of the Electrical Committee were invited to express their views on the committee organization. Although the opinions presented differed in detail there was a general agreement, at this time, that the voting membership of the committee should be limited to approximately its present size, if not decreased, in the interest of efficient operation.

The request of the Pacific Coast Electrical Association for representation on the Electrical Committee was rejected on the grounds that the Association's members were represented through other organizations now represented on the committee.

Favorable action was taken on the request of the International Brotherhood of Electrical Workers and the Illuminating Engineering Society for representation. Each organiation will be invited to designate one voting representative to the Electrical Committee.

A limited membership on the Electrical Committee was voted the International Municipal Signal Association, affording representation on article committees dealing with radio and signaling. These representatives will have the privilege of the floor of the main committee meetings, but will have no vote in main meetings.

With the agreement of the American Institute of Architects, it was voted that the representation of this organization on the Electrical Committee be terminated.

The Committee on Technical Committee Procedure reported further consideration was being given to the organization of the Electrical Committee with a view to possible submission of further recommendations at a subsequent meeting of the Board.

WISCONSIN ASSOCIATION BACKS LICENSE BILL

Electrical contractor licensing and statewide inspection legislation, which failed by a "pocket veto" in 1939 and is again before the Wisconsin State Legislature, has the active support of the Wisconsin Electrical Association, Secretary E. H. Herzberg announced at the annual convention of the organization at Milwaukee on February 14-15. R. R. Knoerr of Milwaukee heads the legislative committee working with other branches of the industry in backing the bill.

The two day meeting brought 160 members and guests together for the business sessions arranged by the convention committee. A plea for better safety conditions and a review of the responsibility of employer and individuals in working with safety was presented in a paper by Clyde Schlueter, Employers Mutuals of Wausau.

A. P. Gale, executive vice-president of Wisconsin Power & Light Co., Madison, asked for more effective partnership between contractor-dealers and utilities for greater public benefits from electric service at lower cost. Paul M. Geary, special NECA representative of Washington, warned that the government's "one contract" policy on fixed fee defense construction is permitting general contractors to organize electrical departments at public expense.

Urging standard apprenticeship requirements and carefully kept records, E. H. Herzberg, chairman of the national committee on apprenticeship training, reviewed the Milwaukee training program for electrician apprentices.

"Profitless Profit," a searching analysis of business losses due to fluctuating market volume and competitive conditions was the subject of a paper by J. W. Collins, secretary of the Chicago Electrical Contractors Association. Reviewing business practices in a typical firm over a period of 10 years he illustrated how an estimated net profit of 10 per cent each year eventually totaled less than two per cent over the whole period. He urged less specialization and a diversity of operations, particularly lighting and rewiring in existing buildings, to flatten volume curves. Ray Ashley, research engineer of the Chicago organization reviewed methods of checking estimates.

"Fluorescent lighting is a great industry opportunity—if we have enough courage," I. L. Illing, illuminating engineer of the Wisconsin Electric Power Co. told the contractors. A jump from lighting systems costing 25 cents per sq. ft. to fluorescent installations costing $3.00 and more a sq. ft., he said, will take new thinking and new courage.

Officers elected at the closing session were R. J. Nickles, Madison, president; E. A. Killoren, Appleton, vice president; R. J. Conklin, Watertown, treasurer and E. H. Herzberg, Milwaukee, executive secretary. Wm. Chamberlin, Ladysmith; L. C. Hackbarth, Merrill; B. H. Barg, Milwaukee; R. W. Springer, Superior and Ross Williams, Appleton were elected to the Board of Directors.

SAN FRANCISCO'S new vice-president and president—Bill Weindorff, vice-president, and George Abbett, president of the S. F. Electrical Contractors Assn. at their first meeting under their administration.

WAGE RISES BOTHER CALIF. CONTRACTORS

Wage increases, the Wages and Hours Act, and changes in the contractors' license law were the major problems discussed during the annual meeting of the Electrical Contractors' Assn. of Northern California at Oakland, January 25. Grover Greider of Stockton, president, completed his term of office and Dan Bronson, California Electric Company, Oakland, was elected president for the new year.

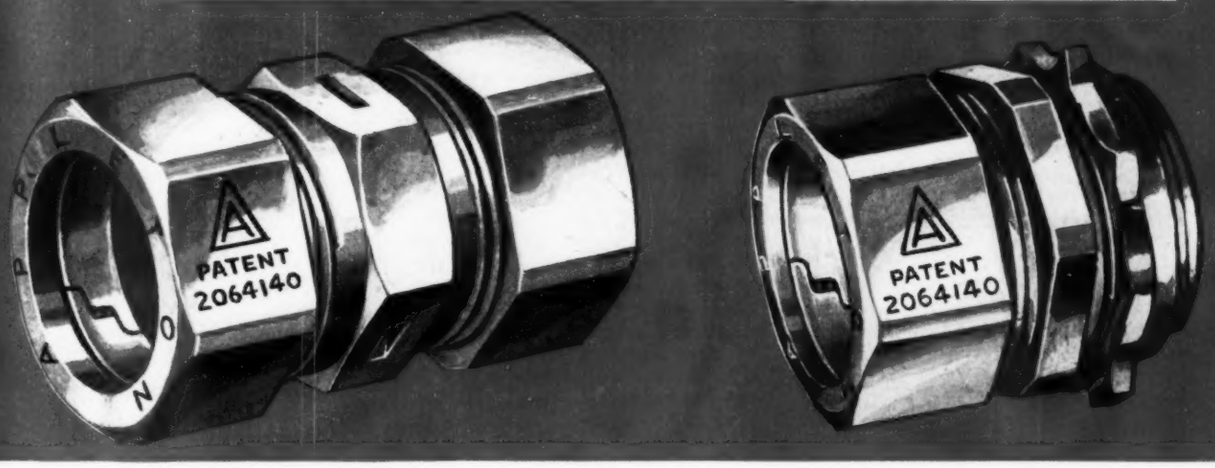
Wage and Hour law interpretation as affecting electrical contractors was explained by Sidney P. Murman, assistant regional attorney for the U.S.A. From his explanation practically all electrical contractors come under the broad ruling of what constitutes interstate commerce and none are exempt from the record-keeping required.

Allen Miller, registrar of contractors for

Outstanding Leadership!

APPLETON COUPLINGS AND CONNECTORS

for Electrical Metallic Tubing — More now in service than all other makes combined!



There are sound reasons for this outstanding Appleton leadership!

Appleton Gland Ring Couplings and Connectors make a rigid, permanent tubing connection that is ***approved watertight!***

The concave, piston ring type of gripping ring insures an easy fit on tubing cut in the field with a hack saw, thereby assuring a positive grip and extreme rigidity in the completed installation.

It is not necessary to use more than *one type* of fitting when you standardize on Appleton Couplings and Connectors. They are expertly designed, and made in Appleton factories to high specification standards. They embody every important improvement for fittings of their type. Heavily cadmium coated.

All sizes have hexagonal nuts, and hexagonal center sections, which are easily held rigidly with a wrench while tightening. Connectors have high knockout closing shoulders, and are equipped with bonding type locknuts, which fasten securely to outlet boxes, panel boxes, and other equipment. Competitively priced!

Appleton stocks are complete; service is prompt and dependable. Costly delays are avoided by specifying *Appleton Fittings*—STANDARD FOR BETTER WIRING!

The name "Appleton;" the registered trade-mark, "Unilets;" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. *We manufacture no private brand goods!*

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Takes the place, on tubing jobs, of *all other tools* but the hack saw! Tightens nuts, reams, removes burrs. Working with two Utility Tools, the electrician can grip the coupling or connector with one, draw up the nut with the other. Makes tubing installation fast and easy, even in tight places!

APPLETON

Conduit Fittings • Outlet and Switch Boxes • Explosion-Proof Fittings • Reolites

[FROM PAGE 76]

the state of California, discussed proposed changes in the law licensing contractors which would stop technical loopholes discovered in administration. A request was made to the Board by the Association to start pre-qualification examinations for electrical contractors along lines similar to those established for general contractors. Miller revealed that of the 39,500 licentiates in contracting of various classes, 2,060 are electrical, a slight decrease since last year.

Most of the afternoon was given to discussion of the increased wage scales asked by local unions in California. San Francisco had just signed a new agreement for a $12 per day scale and it was reported a similar scale was being sought throughout northern California by various locals. The Association appointed a committee to meet with the International officers of I.B.E.W. and discuss a general policy on labor and defense construction. Other subjects covered included the National Electrical Code and ordinances, apprenticeship training, revision of the state accident safety orders. Elected to office were Dan Bronson, president; Tom Robinson of Fresno, vice president; William A. Cyr, San Francisco, secretary-treasurer, and a Board of Directors consisting of: George Abbett, San Francisco, L. French, Sacramento, Grover Greider, Stockton, H. R. Eklund, San Rafael, B. J. Solomon, Pacific Grove, Seth Cohn, San Mateo, Ed Pierce, Vallejo, and Allen G. Wilson, Santa Cruz, and Roy Butcher, San Jose.

ACTION ON NON-TAMPERABLE FUSE

A definite recommendation has at last been made for standardization of the so-called non-tamperable fuse. The special committee of the N.F.P.A. Electrical Committee appointed for that purpose has made a report which will be submitted for action at the special meeting of the electrical committee to be held in June.

In the absence of recommendations from the manufacturers group, the suggestion of all individual manufacturers were reviewed. And a proposed standard has been defined. It's principal features are:—

1. Interchangeability between fuses of various manufacturers.

2. Usable in Edison base with or without an adapter, as may be necessary.

3. Coordination of the use of sizes, that is 16 to 30 Type 'S' fuse cannot be used with 0-15 ampere adapter. However, 0 to 15 fuses may be used with 16 to 30 ampere adapters.

4. Fuse with adapter or new fuse holder reasonably difficult to bridge.

5. No live part exposed to accidental contact with fuse in fuse-holder, either with or without the adapter.

6. Dimensions such as to permit general use in existing cutouts, service equipment, panel boards, etc.

7. The proposed standard will permit considerable latitude of manufacture as to materials, contact arrangements, etc.

The committee states that no change in the Code will be entailed in the adoption of this recommended "Standard Type S Fuse."

"I wish my wife wouldn't put my lunch in my tool box—
I just swallowed a screwdriver between two slices of rye!"

ILLINOIS INSPECTORS PROPOSE FLUORESCENT RULES

Specific rules covering the construction and installation of fluorescent lighting fixtures were submitted for discussion at the annual meeting of Illinois Chapter, Western Section, International Association of Electrical Inspectors on January 25 in Chicago. The preliminary draft of the rules, introduced by D. J. Talbot, acting chief inspector of Chicago, was proposed to supplement Chicago's electrical code and applies only to permanently installed fluorescent lighting equipment. The proposals were turned over to a special Chapter committee for further study.

Important changes in the 1940 revision of the National Electrical Code were reviewed by Arthur L. Abbott of NEMA and the details of the new wire ratings by V. H. Tousley, NFPA field engineer, during the two day meeting.

Officers elected for 1941 are, D. J. Talbot, Chicago, chairman; G. E. Moon, Rockford, first vice-chairman; T. P. Willerton, Chicago, second vice-chairman; J F. Morton, Galesburg, third vice-chairman. The summer meeting of the Chapter will be held jointly with the Iowa Chapter at Davenport, Iowa, in June.

S. F. CONTRACTORS REELECT MAKE OVERHEAD SURVEY

Only a minor change was made in the administration of the San Francisco Electrical Contractors' Assn. at its annual election. George W. Abbett was elected president, to succeed Carl Severin who resigned because work at distant projects made him unable to carry on. Abbett was vice-president last year. William Weindorff was elected vice-president, Edward Martin was retained as secretary and George D. F. Smith as treasurer. Most of the directors were re-elected also. They include Edward W. Scott of Edward J. Lynch Co., C. C. Severin, C. L. Chamblin of California Electric Construction Co., James Surtees of Twin Peaks Electric Co., G. Walter Spencer, Thomas Harris of H. S. Tittle Co., and B. J. Doherty.

An overhead cost survey has been completed for the association by the firm of

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Every Kind You'll Ever Need

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Branches in Important Industrial Centers

SERVICE BEYOND PRICE AND SPECIFICATIONS

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TO OUR ALLY

We Pledge ALL-OUT DEFENSE

THE DEMANDS of National Defense have the absolute right-of-way in our industry. Nothing can be allowed to hinder the production of essential electrical products.

NOTHING SHOULD HINDER THEIR ORDERLY AND ECONOMICAL DISTRIBUTION.

PRODUCTION is receiving a vast amount of publicity. Distribution, practically none.

The average man in the street takes distribution for granted. It would surprise him to learn that the American system of wholesaling is quite as vital to the orderly and economic distribution of electrical products, from Manufacturer to User, as the American system of railroads.

The role of the T & B Wholesale Distributor during National Defense is not dramatic but profoundly important.

Purchasing Agents, of new-born plants as well as of veteran establishments, are using him as a bureau of up-to-date catalog and price information on tens of thousands of "must" items.

Production Executives are begging him to scour the country for supplies not easily obtainable at present.

Plant Engineers, Contracting Firms and Electricians on the job are phoning him every hour for unusual, highly-specialized data — and getting it.

Meanwhile, on top of all that, the T & B Distributor also is moving heaven and earth to satisfy the needs of routine customers not affected by the national emergency.

Our interest in the T & B Distributor is frankly selfish. We as manufacturers cannot get along without him. Operating under The T & B Plan, he is our sole Distributor. He delivers our products to the User far cheaper than we can. We stick together through thick and thin. He is our ally. To him we pledge all-out defense.

T&B

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MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

T & B Distributors cover United States and Canada

Factory, Engineering and Executive Offices, Elizabeth, N.J. • Sales and Service offices in 23 leading cities

[FROM PAGE 78]

Ross L. Perkins, certified public accountants. This survey revealed that the average operating overhead cost of San Francisco contractors was 35.98 per cent on total job. The survey was for the purpose of determining a minimum overhead by which to assist the district attorney's office in the enforcement of the California Unfair Practices Act which prohibits selling below cost. A minimum of 20 per cent on prime cost will be set up as the lowest overhead. Any bid which indicates that less than this minimum has been applied for overhead cost will be subject to investigation by the district attorney's office. The operation of this act has been successful in the grocery business under a similar program.

DALLAS CONTRACTOR SETS RECORD

In a speed test on barracks construction at Camp Bowie in Brownwood, Texas the complete electrical work, from service entrance to turning on the lights, on one 90 by 50 foot building was done in two hours and ten minutes. The wiring system is electrical metallic tubing. The building was erected complete with all services in approximately five hours.

Paramount Electric Company of Dallas, Texas are the electrical contractors, F. B. Von der Hoya is in charge of the work. One of the largest camps in the country now under construction, the Camp Bowie job took over 800 electricians and an office staff of 23 at the peak of construction.

MINNESOTA CONTRACTORS SEE PLUS BUSINESS AHEAD

General business improvement as a result of national defense activity, further progress in fluorescent lighting and an awakening public acceptance of Adequate Wiring are among the important factors which indicate plus business for electrical contractors in the coming year, industry leaders agreed at the combined annual convention sessions of the Minnesota Electrical Association, Minnesota Electrical Council, Minnesota Electrical Inspectors Association and North Central Associated Electrical Industries held at Albert Lea, Minn., February 20–22. Registration showed attendance of more than 300.

A fluorescent lighting clinic under the direction of W. S. Johnson, Duluth, opened the program. Speakers were D. W. Prideaux, General Electric Company; C. T. Bremicker, Northern States Power Company and T. E. Roche, Interstate Power Company.

N. G. Symonds, Vice President of Westinghouse Electric and Manufacturing Company, in reviewing the electrical industry's relation to national defense, said that almost half of electrical manufacturing

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Backed by approval of leading laboratories and built to conform to the high standards set by Chicago Transformer itself, Chicago approved Ballasts are an assurance of better fluorescent lamp performance —a guarantee of customer satisfaction. Laboratory tests against standard reactors for heat tolerances, Watt delivery control, hum requirements, starting time . . . and for wave shape tolerances to minimize radio interference, are all aimed at creating satisfied customers for you when Chicago ballasts are used in installations. Illustrated are double 40 and starting compensator certified by E.T.L. Other numbers will be certified as produced. Write for new price list today.

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Your reputation for good work will be increased if you install these Standard G-E Switches and Convenience Outlets on all your jobs. They will give long, dependable service that will please your customers. Available in brown or ivory color.

Both the G-E Standard Switch and the G-E Standard Convenience Outlet are good looking, sturdy, quality products. They can be used equally well in homes, stores, factories, office buildings, etc.

What is more, these devices are easy to install. They are always uniform, have plaster ears and large binding screws. The switches are completely insulated with Textolite and are available in single-pole, double-pole, 3-way and 4-way types. The convenience outlets have T-slots, caps can be inserted easily; and are available with common feed and ground, separate feed and common ground or separate feed and separate ground.

For further information see the nearest G-E Merchandise Distributor or write to Section D-183, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

In the News

[FROM PAGE 81]

today is for defense or related indirectly to it.

With a demonstration of added utilization of electricity applied to an old wiring installation, L. A. Falk, Wisconsin Power and Light Co., Madison, Wisconsin, proved the causes of inadequacy and the need for rewiring in old homes. Harry Epstein, Westinghouse Electric & Mfg. Co. talked on overcurrent protection; George Garney, State Board of Electricity discussed the state electrical laws, and Glenn F. Rowell, Fire Underwriters Inspection Bureau, reviewed the 1940 code changes at the Friday open conference.

D. M. Wakefield, attorney, reviewed the contractors legal responsibilities under the Minnesota laws and the effects of a recent court ruling holding a bonding company liable for the full amount of a contractor's bond. He predicted an increase in the cost of this type of bond. W. T. Stuart, middle west editor of *Electrical Contracting* spoke before the estimating and accounting clinic on labor estimating under the defense program. Labor shortage and the consequent use of less skilled men may require 40 percent above prevailing units, he said.

A panel discussion on Adequate Wiring sales was conducted by A. E. Schanuel, National Adequate Wiring Bureau, A. W. Swanson of St. Paul and John Ellenbecker, electrical contractors of St. Paul and St. Cloud.

Officers chosen for the Association were: president, Ed Raetz, Rochester; vice president, L. E. Schaffer, Pipestone; and secretary-treasurer, Wm. A. Ritt, St. Peter.

Officers chosen for the Council were: president, Ed Karst, Fergus Falls; vice president, E. J. Micka, Hibbing; treasurer, F. M. Tripp, Minneapolis; and secretary-manager, Wm. A. Ritt.

It was announced that the regular summer meeting will be omitted this year and a one day contractor program arranged in connection with the Western Section, I.A.E.I. meeting at St. Paul in September.

NECA CHAPTERS HOLD ELECTIONS

At the annual meeting of the Nebraska & Western Iowa Chapter, NECA, the following officers were elected to serve during 1941:- Thomas C. Mustain, president, Harvey Tegtmeier, vice-president and R. G. Ford, secretary-treasurer.

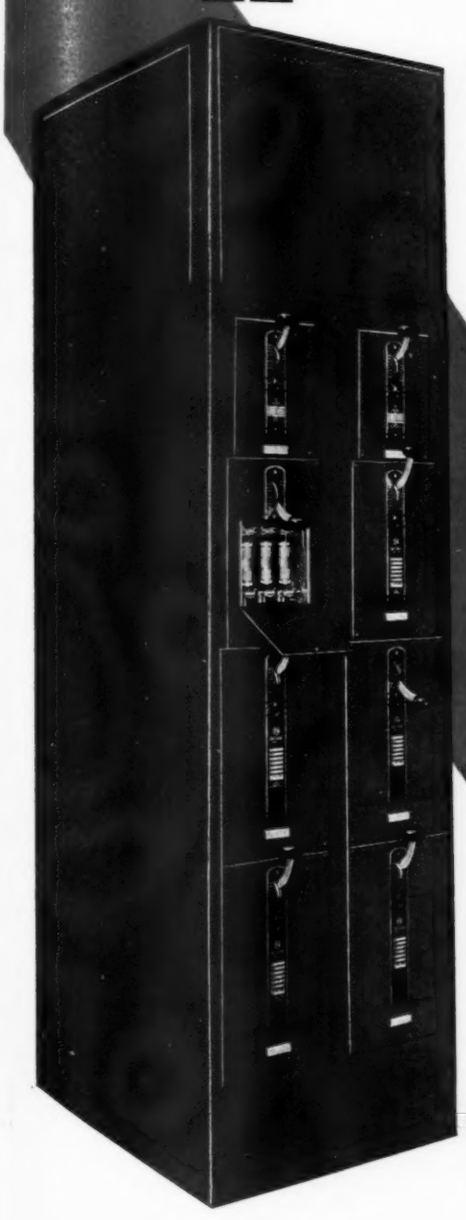
At the annual election of officers of the Quad-Cities Chapter, NECA, which comprises members from Rock Island and Moline, Illinois, Davenport and Muscatine, Iowa, the following were elected for the year 1941: R. D. Speers, Davenport, president; J. H. Olds, Davenport, vice-president and H. P. Wilson, Rock Island, secretary-treasurer.

Here's a Dependable Switchboard!

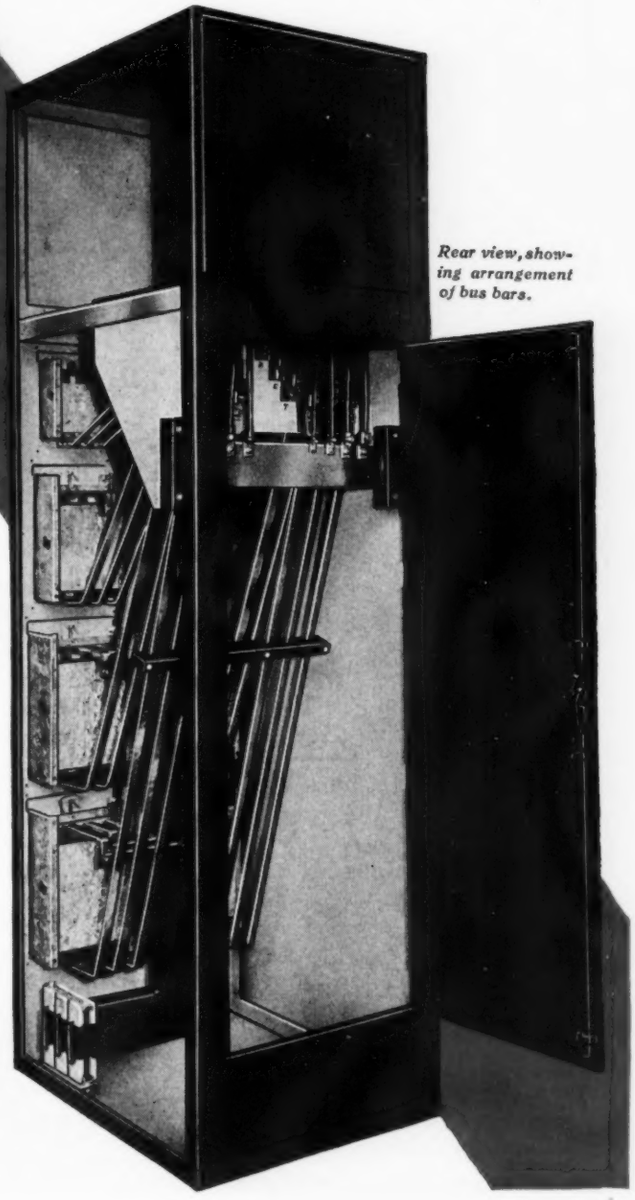
Architects can conscientiously specify it. Engineers can tie it in readily with the power and lighting systems. Contractors can install it quickly and efficiently. And plant owners will appreciate its trouble-free operation.

Ⓕ Shutlbrak Switch Switchboards eliminate "switchboard trouble." They are built for use where *dependability* is a necessity — and in these days of defense preparation, this is of the utmost importance.

These new, safety type, one-piece panel switchboards are ideal for service entrance, motor control and other power and light distribution installations. Designed to occupy a minimum of space, each steel panel is self-contained, with all of the switch units connected to the bus bars of that section. Each switchboard panel unit is individually enclosed, with a junction box built into the top of the panel. Any number of these units may be joined side by side, or otherwise arranged to fit available space.



Switchboard Panel Unit above has 2—60 amp., 2—100 amp. and 4—200 amp. switches in a 28" width.



Rear view, showing arrangement of bus bars.

For More Complete Information

write for Bulletin 59 . . . And consult the nearest Ⓕ Sales-Engineer, whose services are yours without obligation. See Sweet's Catalog (Architectural and Industrial-Engineering sections) or Electrical Buyers' Reference, for their names and addresses. Or, write the Frank Adam Electric Co., St. Louis, Mo.

Frank FA Adam

1891 FIFTY YEARS SERVICE 1941

Great News— The New

UTILITY TESTER

The UTILITY TESTER is a new kind of instrument for testing *all* electrical circuits, and appliances such as — MOTORS, RANGES, HEATERS, IRONERS, WASHERS, SUN LAMPS, TOASTERS, AIR CONDITIONERS, VACUUM CLEANERS, REFRIGERATORS, in fact any and every device that uses an electrical source of current. THE UTILITY TESTER enables every possible measurement necessary to service any electrical utility.

SPECIFICATIONS:

3 WATTAGE RANGES; A.C. AND D.C. 0-100 Watts 0-1000 Watts 0-5000 Watts.

The UTILITY TESTER reads the actual wattage consumption of any appliance, motor, etc., **while it is in operation. This is a feature never before obtainable in any instrument selling for less than $50.**

6 VOLTAGE RANGES; A.C. AND D.C. 0-1 Volt 0-10 Volts 0-50 Volts 0-100 Volts 0-500 Volts 0-1000 Volts.

4 CURRENT RANGES; A.C. AND D.C. 0-1 Ampere 0-10 Amperes 0-50 Amperes 0-100 Amperes.

As far as we know no instrument selling for less than $50.00 has ever enabled current measurements up to 100 Amperes. The UTILITY TESTER provides this service on both A.C. and D.C.

2 RESISTANCE RANGES: 0-300 Ohms 0-3000 Ohms.

The UTILITY TESTER reads all resistances commonly used in electrical appliances and in addition reads extremely low resistances. For instance, 1½ ohms appears on the center of the low ohms scale and resistances as low as 1/50th of an ohm are easily read.

This is a feature never before obtainable in an instrument selling for less than $50.

THE UTILITY TESTER COMES COMPLETE WITH LEADS, PORTABLE COVER, SELF-CONTAINED BATTERY AND INSTRUCTIONS. NOTHING ELSE TO BUY..ONLY **$11.85**

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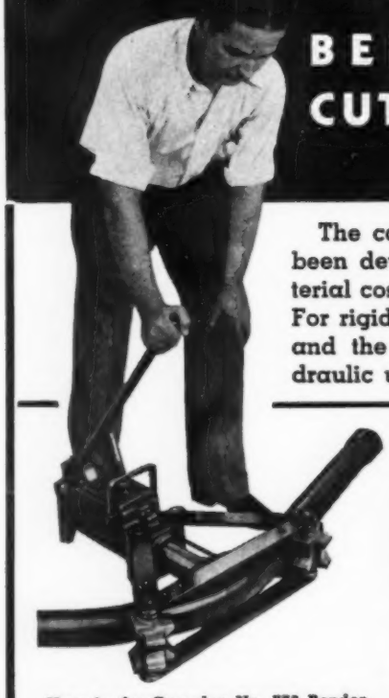

GREENLEE BENDERS . . . TO CUT YOUR BENDING COSTS

The complete line of Greenlee Benders has been developed to lower your labor and material costs on all bending jobs, large or small. For rigid and thin-wall conduit, pipe, bus-bars, and the large sizes of tubing, powerful hydraulic units, operated by hand or motor, are available. Small hand benders will handle all steel, copper, brass, and aluminum tubing up to ¾-inch size. These benders are all readily portable, easy for one man to operate, make smooth, even bends without distortion, and eliminate the need for many costly fittings and manufactured bends. Write today and get all the details about the complete line of Greenlee Benders.

Here is the Greenlee No. 770 Bender for 1¼ to 3 inch rigid conduit and pipe. Sturdily built in one unit, easily carried to the job and set up, does not move or twist about when in use, and has a maximum piston pressure of 25 tons for fast, easy bending.

GREENLEE TOOL CO.
1706 Columbia Ave. Rockford, Ill.

In the News

[FROM PAGE 82]

COMING MEETINGS

Tennessee Electrical Contractors Association—Spring Meeting, Andrew Johnson Hotel, Knoxville, Tenn., March 17–18.

Wolverine State Electrical Contractors Association — Annual Convention, Occidental Hotel, Muskegon, Mich., April 18–19.

National Electrical Manufacturers Association—Spring Conference, The Homestead, Hot Springs, Va., May 11–15.

National Electrical Wholesalers Association—The Homestead, Hot Springs, Va., May 18–22.

National Industrial Service Association—Annual Convention, Hotel Statler, Buffalo, N. Y., May 19–21.

New York State Association of Electrical Contractors & Dealers—Saranac Inn, Saranac N. Y., July 7–10.

National Electrical Contractors Association—Annual Convention, Rice Hotel, Houston, Texas, Oct. 6–8.

National Electrical Manufacturers Association—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27-31.

MARYLAND CONTRACTORS SELECT LEADERS

At the annual meeting of the Electrical Contractors Association of Maryland, Inc., held at the Belvedere Hotel in Baltimore, the following officers and directors of the association were elected for 1941: president, John F. Heath; vice-president, Charles H. Stark, The Stark Electric Co.; secretary-treasurer, Frank M. Meredith, Industrial Power Equipment Co.

BOUNDLESS INITIATIVE aptly describes the activities of Sheridan Taylor in The Electrical Association of Philadelphia. In addition to being the secretary of the Contractors Division of the Association, Sheridan pilots all of the promotional programs of the league, edits the news bulletin and is the proud father of the Maintenance Engineers Division, which he founded some years ago.

PANTHER and DRAGON TAPES

FAMOUS FOR PERFORMANCE

1. First to be Wrapped and SEALED in Cellophane
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3. Strong Distinctive Green Core
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HAZARD INSULATED WIRE WORKS

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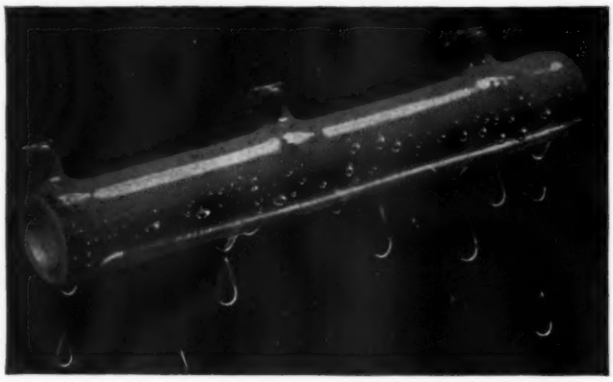

WHEN A RESISTOR SWEATS!

Moisture, visible or invisible, will cause trouble if it can penetrate the protective surface of a resistor. A microscopic examination of the surface of a Ward Leonard Vitreous Enamel Resistor will show why this Resistor is able to give satisfactory service under all climatic conditions. Its freedom from even minute enamel crazes or cracks is unique. With such complete protection of the wire, moisture is effectively excluded. The Vitreous Enamel of Ward Leonard Resistors is processed at a temperature above 1400°F. Thus all elements of the enamel are perfectly fused and envelop the wire in a sealed, protective, glass-like enclosure. Write us today for up-to-date resistor bulletins.

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STARTER SWITCHES

LISTED AS STANDARD BY UNDERWRITERS' LABORATORIES, INC.

FS-2 FOR 15 & 20 WATTS

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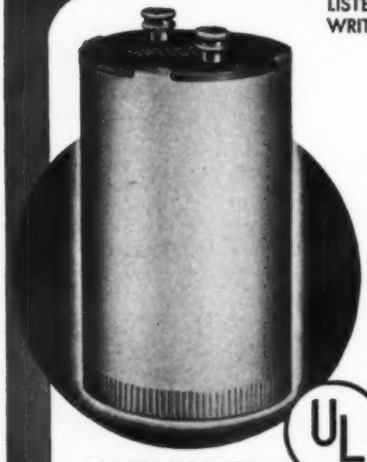

FS-6 FOR 100 WATTS

Precision and performance have established a reputation of quality for Sheldon starter switches. The name Sheldon is your assurance of a pretested, faster starting, quality switch that will perform with uniform precision at all times.

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In the News

[FROM PAGE 84]

The members elected as directors will also constitute the Executive Committee. They are: Sydney C. Blumenthal, Blumenthal-Kahn Co.; V. M. Miller, Miller-Liskey Co., Hagerstown; Harry Morris, Morris & Ward and J. R. Stolzenbach, The Roland Electrical Company.

The association is exerting a concerted effort to secure cooperation and unity among the branches of the electrical industry in Maryland and at present is formulating an aggressive 1941 program.

WISCONSIN NISA CHAPTER FORMED

Motor repair shops and motor dealers of Wisconsin organized the Wisconsin Chapter of the National Industrial Service Association at a meeting in Milwaukee in January. Eleven shops signed up as charter members.

Ed Herzberg, executive secretary of the Wisconsin Electrical Association, handles the affairs of the new organization in a similar post. A. G. Tellier of Herman Andrae Electric Co. is president; C. L. Harry, Holt Electric Motor Co., first vice-president; Wm. J. Bentley, Bentley Electric Co., second vice-president and Roy Schulz, L. Schulz & Son Electric Co., secretary-treasurer.

THREE NEW GROUPS CERTIFY WIRING

Three additional local industry groups will certify adequate wiring installations in the continuing national campaign.

The Columbus (Ohio) Adequate Wiring Committee will certify in the city of Columbus, and in Delaware, Franklin, Licking, Madison, and in part of Pickaway counties. The Electric League of Charleston (S. C.) will operate in Charleston and Dorchester counties. The Beloit (Wis.) Adequate Wiring Bureau will operate in the city of Beloit. This totals forty-six local bureaus now licensed by the National Bureau.

ASK TO PRE-QUALIFY

California's State Contractors' License Board is preparing to set up a pre-qualification examination for electrical contractors who apply for state licenses. The first pre-qualification examination procedure was instituted last fall for general contractors and resulted in a reduction of general contractor licentiates by 70 per cent among new applicants. The examination covers the fundamentals of business practice, the state laws, and some technical phases of the business considered necessary.

CRESFLEX NON-METALLIC SHEATHED CABLE · SERVICE ENTRANCE CABLE · MAGNET WIRE · BARE WIRE

VARNISHED CAMBRIC CABLE • RUBBER POWER CABLES • BUILDING WIRE

ARMORED CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • SIGNAL CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

DEFENSE

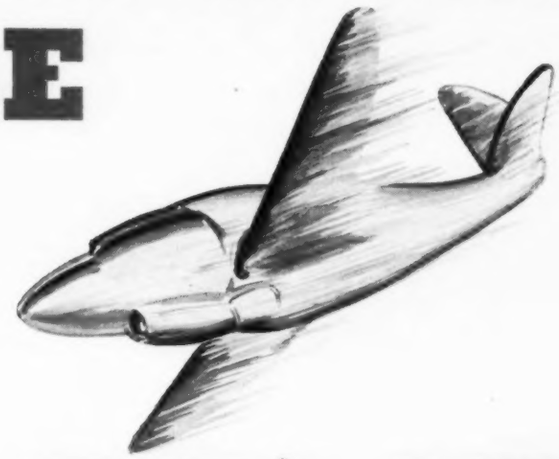
calls for

MORE SPEED—
MORE POWER

and

CRESCENT

meets the emergency



CRESCENT has been working night and day, meeting defense needs as well as keeping up with the demands of normal business. Every man is at his post—putting his utmost efforts into producing the finest wires and cables we know of—helped by over 50 years of knowing how.

- RUBBER POWER CABLES
- VARNISHED CAMBRIC CABLE
- PORTABLE CABLES
- PARKWAY CABLES
- A.B.C. ARMORED BUSHED CABLE
- BUILDING WIRE & CABLES
- CRESFLEX NON-METALLIC SHEATHED CABLE

CRESCENT INSULATED WIRE & CABLE CO.

Ask Your Electrical Wholesaler for

CRESCENT
WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

EFFICIENT HIGHER LEVEL INDUSTRIAL ILLUMINATION

OAMCO REFLECTORS

2-LIGHT

FOR 100-WATT

60-INCH T-17 LAMP

RLM

FLUORESCENT LAMP FIXTURE

Weatherproof Bracket Fixture

for farm yards, areaways, etc. Complete with porcelain enamel reflector and all fittings. Wire cut to proper length.

Essential features: shielding angle 14°—reflection factor of 79%—light output 75%—porcelain enamel reflector white inside, grey outside. Made with or without apertures for directing light upward. Lamp holders, ballast, starter switches contained in housing—wiring can be done in housing and reflector attached by thumb nuts. Send for new catalog #98 or see your Wholesaler.

OVERBAGH & AYRES MFG. CO. 411 S. CLINTON CHICAGO, ILL.

TWO INSTRUMENTS EVERY LABORATORY NEEDS

The Acme Insulation Breakdown tester not only indicates grounds, shorts or opens but provides for the checking of circuits at approved voltage standards (double the rated voltage plus 1000). Manually adjusted with secondary voltage rating of 500, 1000, 1250, 1500, 1750, 2000 and 2500 volts. Portable and designed with every safety factor.

The Acme Voltrol (made in portable and panel mounting types) gives complete manual control over line voltage in stepless range from 0 to 135 volts. Not a resistance type regulator, output voltage is independent of load.

Acme also manufactures Luminous Tube Transformers, Fluorescent Lamp Ballasts, Radio and Television Transformers, Mercury Vapor Lighting Transformers, Air-Cooled Power Transformers.

THE ACME ELECTRIC & MFG. CO.
36 Water Street • Cuba, N. Y.

Acme ACME Electric TRANSFORMERS

NEW

20" and 24" AIR Circulator FANS

Popular sizes. Popular prices. Floor, Low stand, and wall models.

From any manner of appraisal—appearance, design, air delivery and construction, these Signal 20" and 24" chrome plated air circulator fans have instant appeal—and are exceptional values. Features in addition to vertical plane adjustment include 3 speed operation, specially designed fan blades for maximum air delivery and quiet operation. Write for complete specifications and prices.

Also a complete new line of streamlined desk fans. Send for new 1941 catalog now.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan
Offices in all principal cities

SIGNAL

In the News

[FROM PAGE 86]

NECA OPENS WASHINGTON OFFICE

In order to more effectively handle contacts with Government departments on the defense construction program and other Government contract procedure and legislative matters, NECA has opened an office at 202 Barr Building, Washington, D. C.

—WITH THE— Manufacturers

G-E Changes

William C. Yates has been appointed assistant manager of the Industrial Department of the General Electric Company. Since 1937 Mr. Yates has been manager of the control and renewal parts division of the Industrial Department, and he will continue to have charge of this division.

Announcement has been made of the consolidation of the clock section of the G-E appliance and merchandise department with the heating device and fan section.

Alfred C. Sanger, who has been manager of the heating device and fan section, becomes manager of clock operations as well. The clock section was formerly under the direction of John P. Rainbault, who has been appointed manager of the air conditioning and commercial refrigeration department with headquarters in Bloomfield, N. J.

R. O. Fickes, formerly accountant, has been appointed assistant to Mr. Sanger. Fred Sindermann, formerly sales manager of fans, has been assigned to Mr. Sanger's staff.

Marshall B. Ross has been named sales manager for fans and sunlamps, and C. R. Thorson will continue as sales manager for clocks.

B. M. Tassie has been appointed manager of appliance sales for the newly consolidated Pacific district of the G-E appliance and merchandise department, with headquarters at San Francisco.

Chicago district activities of the General Electric Company and affiliated companies, formerly scattered in nine separate locations, are now housed in G-E's new building in Chicago.

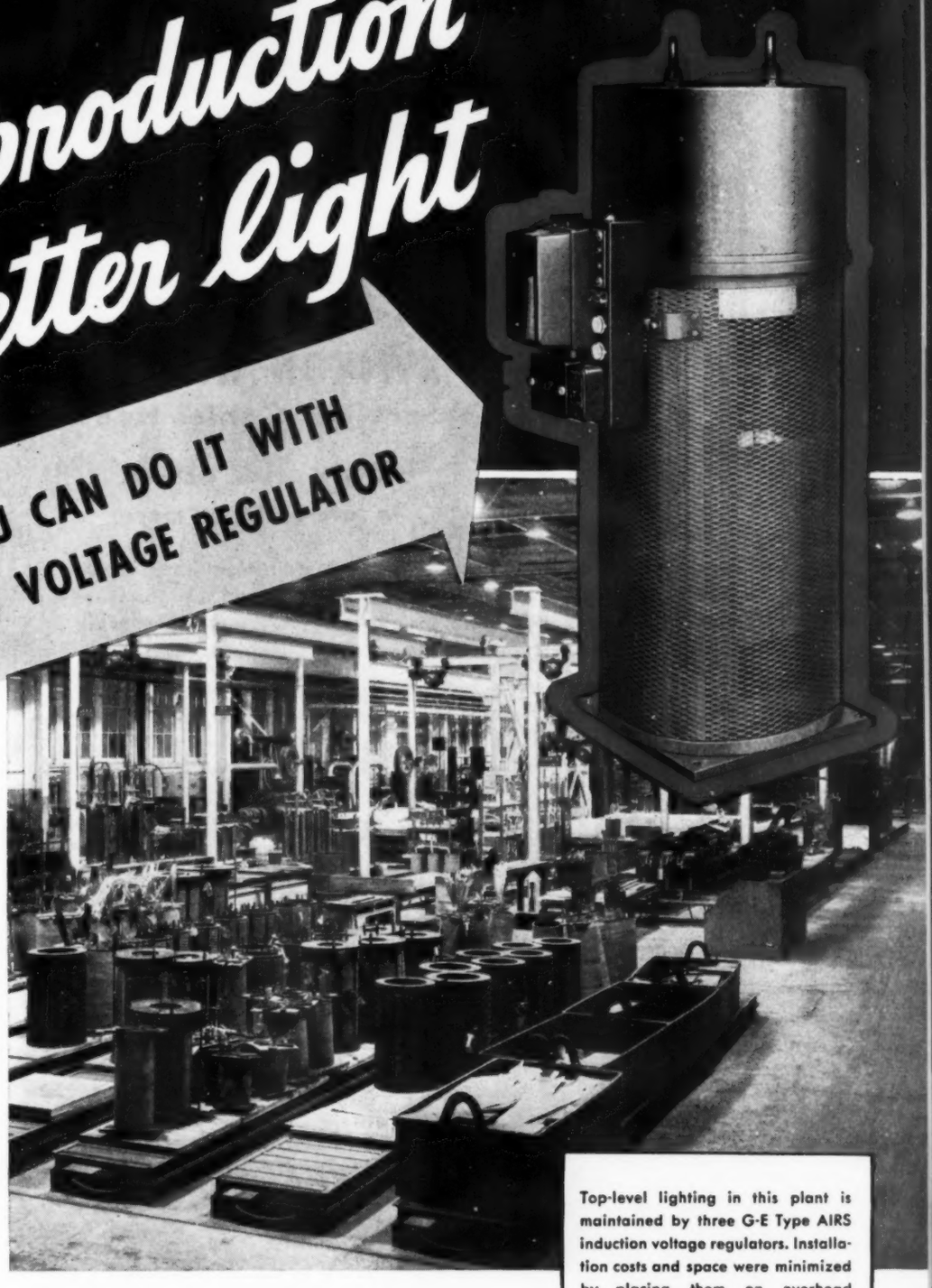
•

Westinghouse Appointments

Westinghouse Electric & Manufacturing Co. elected four new vice-presidents. They are Bonnell W. Clark of New York, now president of the Westing-

Boost production with better light

YOU CAN DO IT WITH THIS VOLTAGE REGULATOR



LIGHTING usually drops off faster than voltage—often *three times as fast!* That's why *regulated* lamp-circuit voltage is so essential for high light levels and high production levels. And that's why G-E air-cooled induction regulators are becoming so popular as low-cost aids to better lighting.

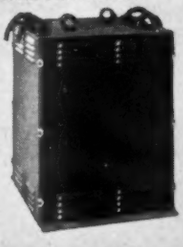
They're compact—practically portable—so out-of-the-way installations are easy. Install them indoors—anywhere—no costly fireproof vaults are needed. First cost? *Low.* Maintenance? Negligible.

Better light *pays off* in bonus production. So call your G-E representative now. He'll help you select the proper regulator to keep *your* light levels UP. General Electric, Schenectady, N. Y.

Top-level lighting in this plant is maintained by three G-E Type AIRS induction voltage regulators. Installation costs and space were minimized by placing them on overhead platforms.

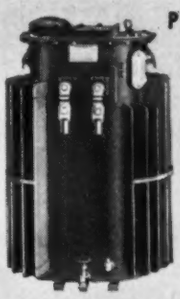
MORE G-E PRODUCTION BOOSTERS

AIR-COOLED TRANSFORMERS



Like Pyranol transformers, these units can be installed indoors to obtain greater capacity plus savings in both time and materials. Particularly adapted to circuits 600 volts and below. (Bulletin GEA-897H)

PYRANOL TRANSFORMERS



An easy way to provide for new loads. Install them indoors at load centers to get power right where you want it. No vaults required. Close-to-the-load installations save secondary copper, give better voltage, and reduce losses. (Bulletin GEA-2048B)

PYRANOL CAPACITORS

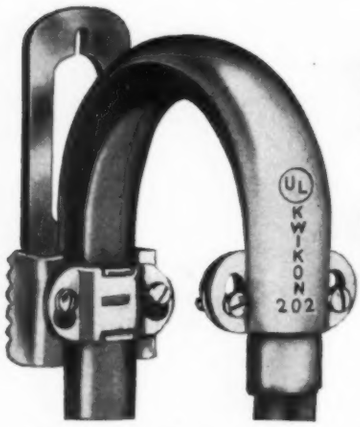
If power-factor is low, these units boost wiring capacity 10 to 40 per cent. They neutralize reactive (nonworking) current to make room for more load. Moreover, they may save enough in power costs to pay for themselves in one to three years. (Catalog GEA-77L)

GENERAL ELECTRIC

10-20-5400

Here's How

to install



Service Entrance Cable

Faster—More Economically

use

KWIKON No. 202

Service Cable Head

only 20c each

in lots of 50 or more

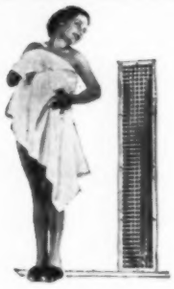
Economy and an easier and faster installation have made Kwikon No. 202 a national favorite. Improved by the new hanger type back, which makes the assembly and installation so much easier, it comes to you at no additional cost.

To be completely satisfied on your next Service Cable Head requirements, use Kwikon No. 202.

Approved by Underwriters' Laboratories, Inc.

KWIKON CO. 1850 W. Washington Blvd. CHICAGO, ILLINOIS

EVERY BATHROOM NEEDS THIS Extra HEAT



You need this bathroom heat every day in the year. When it's too warm for unit heat or too cold for unit heat alone—Thermador Built-In Bathroom Heaters are the answer. Just a flip of the switch and you are instantly blanketed in flameless, fumeless electric warmth.

BATHROOM HEATERS

THERMADOR ELECTRICAL MFG CO.
5119 So. Riverside Dr., Dept. EC 3
Los Angeles, California

Gentlemen
Please send me complete contractors specifications and prices.

Name_____
Street_____
City_____ State_____

WOLVERINE SOLDERING LUGS

- ***High-Conductivity***
- ***Square-End***
- ***Uniform Dimensions***

BUY FROM YOUR JOBBER

WOLVERINE TUBE CO.
DETROIT, MICHIGAN

In the News

[FROM PAGE 88]

house Electric Supply Company, a subsidiary; R. A. McCarty of Philadelphia, manager of the Steam Division; Frank D. Newbury of Pittsburgh, manager of the Emergency Products Division; and A. C. Streamer, of Pittsburgh, general manager of the East Pittsburgh Division.

John H. Ashbaugh, formerly engineering manager at East Springfield Works, has been appointed assistant-manager of manufacturing and engineering for the Merchandising Division. He will maintain his headquarters in East Springfield but will be responsible for the work at both Mansfield and East Springfield.

Robert L. deLoache has been made manager of the Philadelphia Switchboard Plant. He was formerly superintendent of the switchboard department in Atlanta.

•

WESCO Transfers

N. A. Hjelte, merchandise supervisor of the Chicago office of the Westinghouse Electric Supply Company, has been named new merchandise supervisor for the Davenport, Iowa, office of the company.

W. R. Groves has been transferred to Omaha, Neb., as merchandising supervisor of the office there. He was formerly merchandising supervisor of the Chicago office.

•

Efcolite Corporation, Trenton, N. J. has appointed Fred P. Wertheimer as general sales manager and head of a management board that includes Alex T. Peterson, plant manager and Carl S. Wellhofer, designer and engineer. Mr. Wertheimer was formerly sales promotion manager and sales and advertising manager.

•

Roller-Smith Company, Bethlehem, Pa. announces the appointment of the John W. Clarke Company, 327 S. La Salle St., Chicago, as representative for the Chicago territory. This territory comprises the northern half of Illinois, northern Indiana, Wisconsin and eastern Iowa.

•

Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago is now constructing a new plant in the Clearing Industrial District in the Chicago area and expects to move into it during the first part of April.

THE ONE AND ONLY TIME SWITCH

WITH JUST TWO GEARS IN THE OPEN

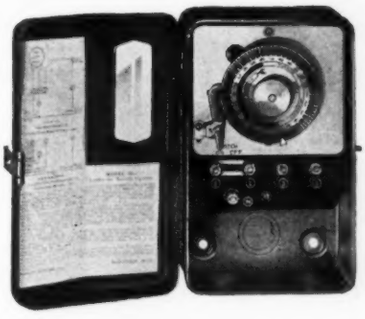
$13.00 LIST

ALL other gears operate in a sealed, oil filled chamber and are thus constantly lubricated. Dust has absolutely no effect on this Time Switch.

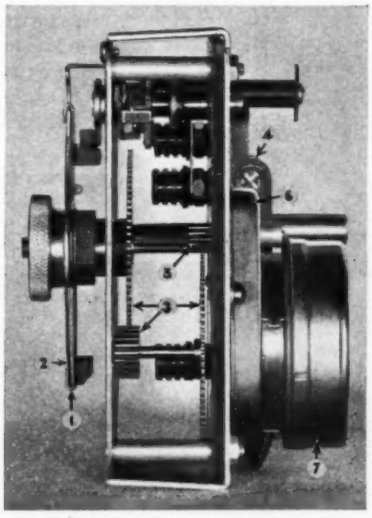
SERIES 300

Series 300 is an example of how Paragon engineering research, coupled with increased production, has developed a far superior product at the same low price. This Switch is guaranteed for temperatures as low as 20 degrees below zero. It is ideal for signs and all general switch applications. Its design and construction features are modern throughout and surprisingly simple. A small, neat, compact, streamlined unit. Planned for years of continuous dependable performance.

Approved by Underwriters for 30 Amperes per pole—Re-Examination No. File E-10597. Available through all leading wholesalers. Send for Bulletin giving full details.



This unit has 2,000% more dial power than is required to operate the switch.



1. Simple, easy adjustment for times of operation.
2. 42 lbs. operating pressure here. Only 2 lbs. required to trip switch. Thus operating safety factor—2000%.
3. Only *two* heavy wheels and one heavy pinion in *entire* open gear train.
4. 30 Ampere heavy silver contacts heavy bronze switch blades.
5. 1/30 R. P. M. here.
6. All motor reduction gears in sealed oil-filled gear box.
7. Heavy Duty Self-Starting Synchronous Motor—Slow initial rotor speed of 450 R. P. M.

PARAGON ELECTRIC COMPANY

Builders of Control Instruments since 1905

401 SOUTH DEARBORN STREET, CHICAGO, ILLINOIS

REWIRE IN RECORD TIME WITH FLAMENOL* SMALL DIAMETER BUILDING WIRE

Flamenol Building Wire will help you to get rewiring jobs today. With it, buildings can be rewired quickly either for National defense purposes or general purposes. Simply replace the present wires in existing conduit with more Flamenol Wires or Flamenol Wires of larger capacity. New conduit is not necessary. Mess and expense are saved—savings which also help you to sell Flamenol rewiring jobs.

Flamenol Small Diameter Building Wire is insulated with a synthetic compound requiring no braid. It is superaging, resistant to heat, oils, acids, alkalies, and moisture. It has high dielectric and mechanical strength. It's available in a variety of bright colors in sizes 14 to 4/0.

For further information and samples, see the nearest G-E Merchandise Distributor or write to Section W-183, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

* Reg. U.S. Pat. Off.

G-E WIROMETER

For Computing Wiring Problems In Accordance with 1940 N. E. C.

You'll find the Wirometer helpful in selecting the right wire quickly when making layouts. The Wirometer permits quick calculation of conduit fill, current-carrying capacities when three or more wires are run in conduit, etc. Wirometers may be obtained from G-E Merchandise Distributors.

GENERAL ELECTRIC

In the News

[FROM PAGE 90]

Cook Electric Company, Chicago, elected new officers at its annual stockholders and directors meeting. They are G. R. Felds, chairman; W. C. Hasselhorn, president; J. S. Baker, vice-president; C. E. Lundeen, secretary-treasurer; J. F. Jaap, assistant secretary and C. Ruth, assistant treasurer.

•

Hygrade Sylvania Corporation, Salem, Mass. recently elected F. J. Healy as vice-president of the Corporation. Mr. Healy will continue his duties as general manager of the Lamp Division with headquarters at Salem.

•

John A. Roebling's Sons Company has appointed Percy Jenkins as manager of the Boston branch. Mr. Jenkins was associated with the Wickwire Spencer Steel Company for fifteen years.

•

Eagle Electric Mfg. Co., Inc., Brooklyn, N. Y. announces the appointment of Jules J. Dreyfuss as director of sales. Mr. Dreyfuss was formerly sales manager of the Marks Products Corp.

•

G-M Laboratories, Inc. has moved into its new building at 4314-26 North Knox Avenue, in the Montrose Industrial District, Chicago.

•

DeVilbiss Company recently opened a new sales and service branch in Chicago. The new building is located at 1280 West Washington Blvd.

•

Wolverine Tube Company, Detroit, announces the opening of a warehouse in Chicago at 1632 W. Lake Street. H. H. Chaplin will be in charge.

•

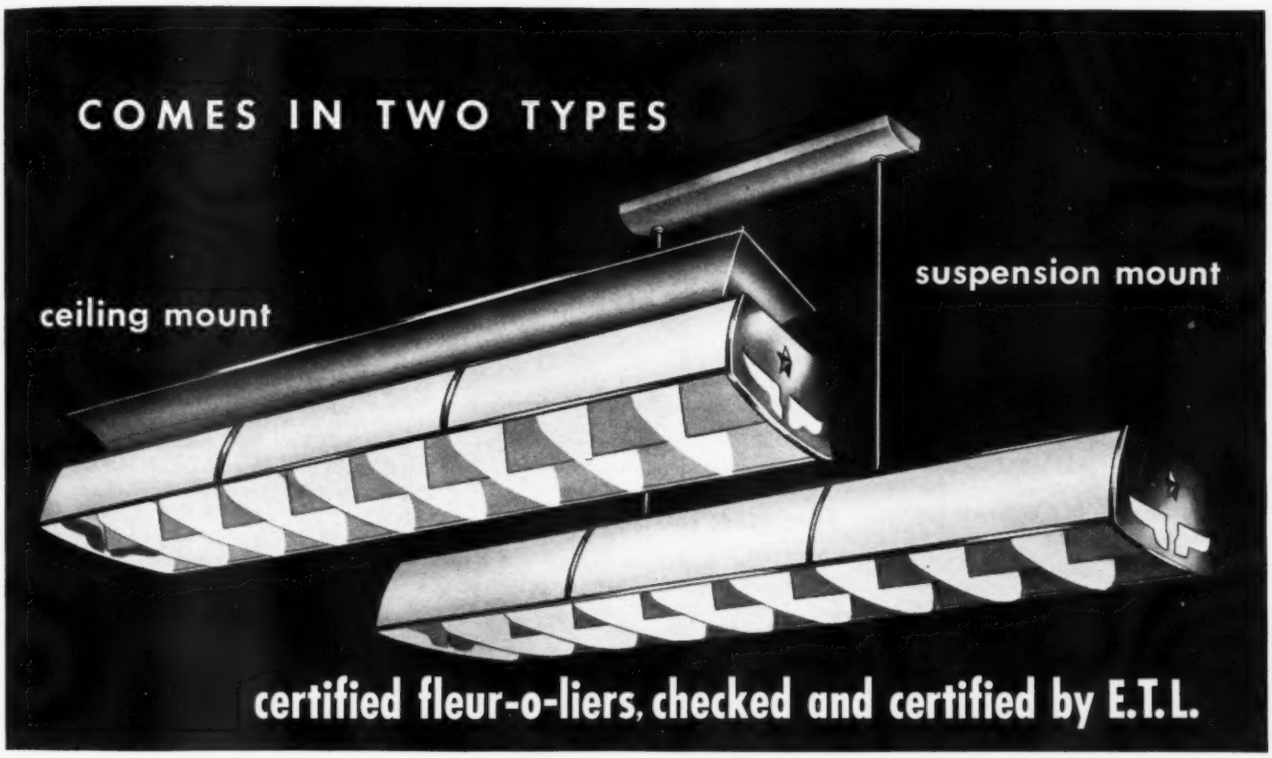
Allis-Chalmers Manufacturing Company has made Ralph R. Newquist the manager of the district office at Houston, Tex.

•

Reliance Electric & Engineering Company, Cleveland, has opened a sales office in Minneapolis, Minn., with Elwood H. Koontz as district manager. Mr. Koontz was formerly in the Philadelphia office.

WAKEFIELD *announces* THE GENERAL

for FLUORESCENT lighting with the new 100-watt lamp



Here's the answer for stores and offices with high ceilings and for higher levels of light!

Now you can give the store or office with high ceilings the benefits of amazing new fluorescent lighting effectively. Or you can give any commercial building *higher levels* of fluorescent lighting.

For the two new Wakefield GENERALS use the new 100-watt fluorescent lamps . . . and use them efficiently! They're both certified Fleur-O-Liers . . . which means that they're checked and certified to 50 rigid standards for satisfaction by impartial Electrical Testing Laboratories. They provide balanced performance and satisfactory service. In a nutshell, they give fluorescent lighting at its best.

And they offer you these specific selling advantages: Pleasing appearance with smooth functional lines; semi-direct distribution of light; high efficiency and high utilization of light; adequate shielding; easy lamp replacement; easy installation. And the ceiling type fits in perfectly with standard acoustical tiles!

Write us for a bulletin giving full details.

Wakefield also makes many other fluorescent lighting fixtures for commercial use

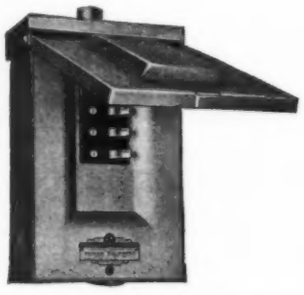
THE F. W. WAKEFIELD BRASS COMPANY

31 Contract Park, Vermilion, Ohio

EQUIPMENT News

Service Equipment

The F-A Raintite enclosure for load centers and service equipment is for outdoor application, in connection with yard lighting, signs, floodlighting and general use. It is impervious to rain, snow and sleet. Box is of galvanized steel, cover bonderited to prevent corrosion. Hinged cover may be padlocked to prevent tampering. It is for load centers and service equipment of 2 to 16 circuits, 120 volt. Large assemblies in panelboard construction are also available in these weather proof enclosures. Frank Adam Electric Company, 3650 Windsor Place, St. Louis, Mo.

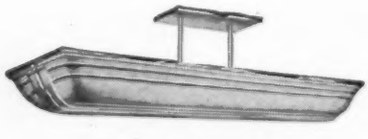


FRANK ADAM RAINTITE ENCLOSURE

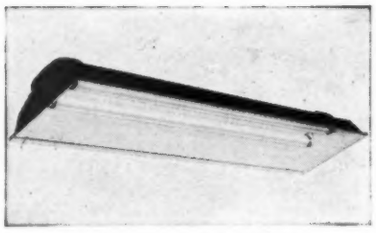
■

Fluorescent Unit

This new fluorescent lighting unit for commercial and residential application has a sculptured shield molded of a new plastic composition which produces softly diffused glare-free illumination. The frame and shield are so designed that the light may flow evenly in all directions over the entire use area. Available in two and four tube units for use with white or daylight lamps for work and reading and with colored lamps for decorative effects. Federal Fluorescent Corp., 429 West Superior St., Chicago, Ill.



FEDERAL FLUORESCENT UNIT



WESTINGHGOUSE LUMINAIRE

Fluorescent Luminaire

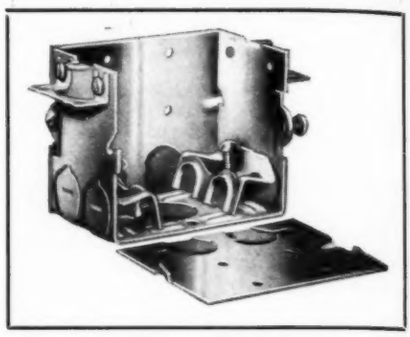
This new fluorescent luminaire has been designed for general and supplementary high-level lighting in industrial or commercial areas. It uses two 100-watt, 60-inch, white or daylight fluorescent lamps. Available for operation on 110-125, 199-216, and 220-250 volts, 60 cycle a.c. Fixture consists of hood, reflector, lamp holders, starting device and ballast equipment. Available in the direct and diffuser types. Units are arranged for rigid or flexible conduit or chain suspension mounting. Westinghouse Electric & Manufacturing Co., Cleveland, Ohio.

■

FOSTORIA REFLECTOR

Reflector

This new "Parasphere" reflector is for infra-red baking. Known as Model "QR," it is hexagonal in shape, making it possible to obtain an enclosed type of near infra-red tunnel. Because it is possible to "nest" hexagonal shapes closely, an almost solid reflecting surface is obtained in a multiple assembly installation. It measures 10¼-in. in diameter and is available in single units or in multiple assemblies. A smaller size model "QM" measures 7⅞-in. in diameter. The Fostoria Pressed Steel Corporation, Fostoria, Ohio.



G-E SWITCH AND OUTLET BOX

Switch and Outlet Boxes

All G-E switch and outlet boxes furnished with clamps now have new knockouts, pryouts, clamps and cable clamping ribs, which save space and make wiring easier. Knockouts are horse-shoe shaped, permitting cable to lie flat on bottom of box. Removal of knockouts is possible after a box is installed. New clamps are provided for "BraidX" in the SP26625 series of shallow round outlet box and in switch boxes. Other features include ribs in bottom of box to help hold cable securely and new mounting ears which provide greater range of adjustment. General Electric Company, Bridgeport, Conn.

■

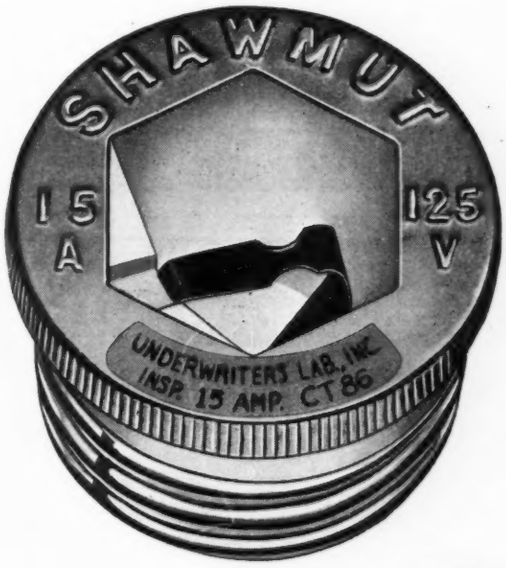
Range Switch

This redesigned combination range switch has 60 ampere two-pole main and range circuits and four one-pole plug fusible circuits. Devices with parallel main and range switches are available. Solderless connectors are furnished. There are 60-ampere tap-offs after main fuses for water heater circuits or mains extension. Main and range fuse-breaks are non-interchangeable. Fuse-breaks have test holes so fuses may be tested without removing fuse puller. Many knockouts provided. Metering endwalls are available. Square D Company, 6060 Rivard Street, Detroit, Mich.

SQUARE D COMBINATION SWITCH

NO PHOTO FINISH

WHEN IT'S A CHOICE BETWEEN SHAWMUT PLUG FUSES AND OTHERS



C-QUICK

Glass top, complete insulation. Rating reads by color and by figure in any position. Link parts on overload, glass blackens on short circuit; each equally easy to detect. White link on black background; highest visibility before and after blowing. The supreme quality in plug fuses.

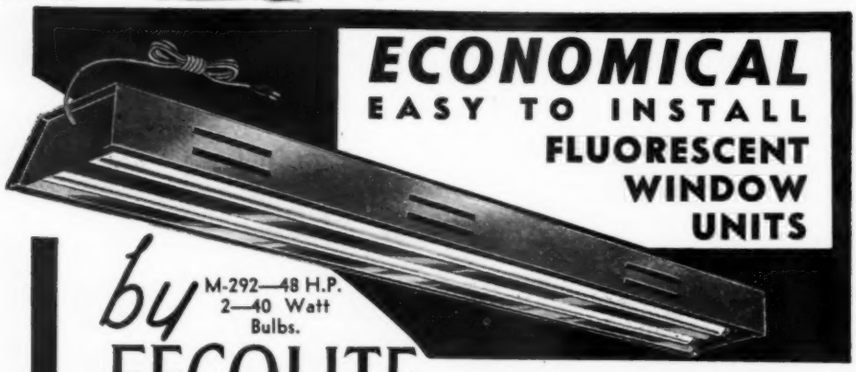
BLAC-LINK

Porcelain base, heavy brass cap, and large clear mica window. Black link, white background; highest visibility before and after blowing. Link parts on overload, window blackens on short circuit; each equally easy to detect. For full information about C-Quick and Blac-Link fuses, ask for our Bulletin 404.

After Blowing

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS FOR NEARLY HALF A CENTURY



ECONOMICAL
EASY TO INSTALL FLUORESCENT WINDOW UNITS

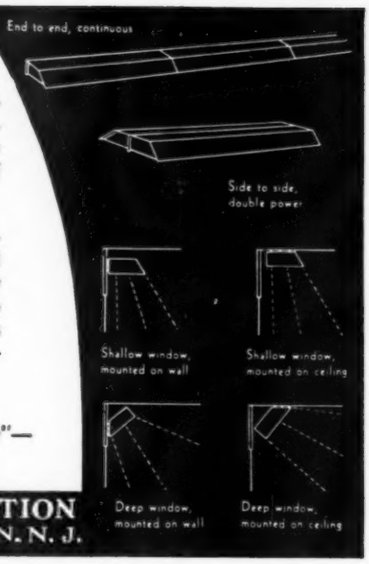
by EFCOLITE

M-292—48 H.P. 2—40 Watt Bulbs.

Complete flexibility and ease of installation is offered by this scientifically designed series of Fluorescent Window Lighting Units that simplify all types of window lighting problems.

Deep or shallow windows may be floodlighted with equal effectiveness to add sales impact and increased desirability to merchandise on display. Attractive low prices and low installation costs open a vast market for conversion installations.

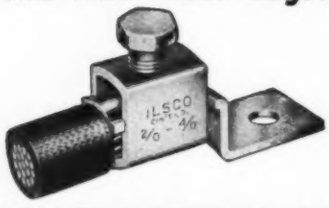
Cash in on this "Profitable Opportunity"—Send TODAY for Bulletin M-30.


End to end, continuous
Side to side, double power
Shallow window, mounted on wall
Shallow window, mounted on ceiling
Deep window, mounted on wall
Deep window, mounted on ceiling

EFCOLITE CORPORATION TRENTON, N. J.

ILSCO
SOLDERLESS CONNECTORS

HAVE YOU TRIED The New Ilsco Lugs?



BUILT FOR OVERLOADS!

The new design—as passed by the Underwriters' Laboratories May 1, 1940.

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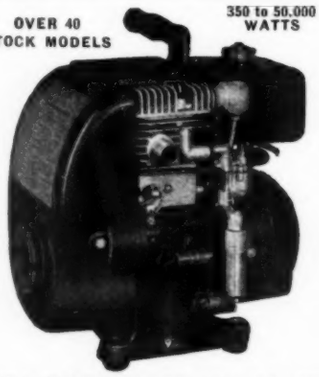
ILSCO COPPER TUBE AND PRODUCTS, INC.
5629 MADISON ROAD — CIN., O.

ONAN DEPENDABLE ELECTRIC PLANTS

OVER 40 STOCK MODELS

350 to 50,000 WATTS



ONAN ELECTRIC PLANTS have been giving SATISFACTORY PERFORMANCE for over 15 years in ALL PARTS OF THE WORLD. Dealers realize SATISFACTORY PERFORMANCE allows them to "Reap the Harvest" through added Sales.

Built COMPLETELY by D. W. ONAN & SONS, they are of SIMPLE, COMPACT, STURDY CONSTRUCTION, and incorporate HIGHEST QUALITY MATERIALS and WORKMANSHIP.

Used in HOMES, FARMS, SCHOOLS, THEATRES, PUBLIC BUILDINGS, CITY, STATE and FEDERAL DEPARTMENTS, BOATS, TRUCKS, TRAILERS, RADIO STATIONS. Many others. Operate LIGHTS, RADIO TRANSMITTERS and RECEIVERS, Motors, Tools, Appliances, X-Ray and other Medical Equipment and Standby Emergency Service in case of POWER LINE FAILURE.

Sizes through 50,000 Watts—any Voltage or Frequency—Air or Water-Cooled—Gasoline, Natural Gas, Oil or Diesel Powered,—110 or 220 Volt, A.C., 12, 32 or 110 volt, D.C. or any Special Voltages are available. Many NEW 1941 Models.

Write NOW for Complete Dealer's Proposition.

D. W. ONAN & SONS
793 Royalston Ave., Minneapolis, Minn.

EQUIPMENT NEWS

[FROM PAGE 94]

Contactor

This all-purpose contactor replaces the old fashioned burglar alarm springs. It is available in open circuit, for closed circuit and for momentary contact. It may be used on windows, doors, transoms, lattice grills, as a foot push or on machinery. It is so designed that pressure from any direction will depress the nosing and permit contact. It is fully insulated for use in wood or metal. It is available in three types. Size is 1⅝-in. high, 1⅝-in. deep, including flanges. Edwards and Company, Inc., Norwalk, Conn.

EDWARD CONTACTOR

■

Rubber Cord

"CordX", the G-E 60 per cent type S all-rubber cord, is designed for use where service conditions are severe. Flexing life of new cord is doubled and stripping is made easier by new construction, which employs a bias cotton wrap placed over the cord and vulcanized into inner surface of rubber jacket. This wrap supplies an anti-friction surface between jacket and rubber-insulated conductors. A cotton separator is applied over the copper to prevent corrosion and relieve strain on wires. General Electric Co., Bridgeport, Conn.

G-E "CORDX"

■

Insulating Varnish

A new formulation of Harvel 612-C insulating varnish has been developed. It is a phenol-formaldehyde synthetic resin-base varnish made from cashew nut shell liquid, which polymerizes upon baking to an infusible, insoluble state. It is an internal drying varnish. It resists vibration, bonding the conductors into compact unit-acting mass. This new 612-C is said to possess unusual retention of insulating strength at high operating temperatures. Irvington Varnish & Insulator Company, Irvington, N. J.

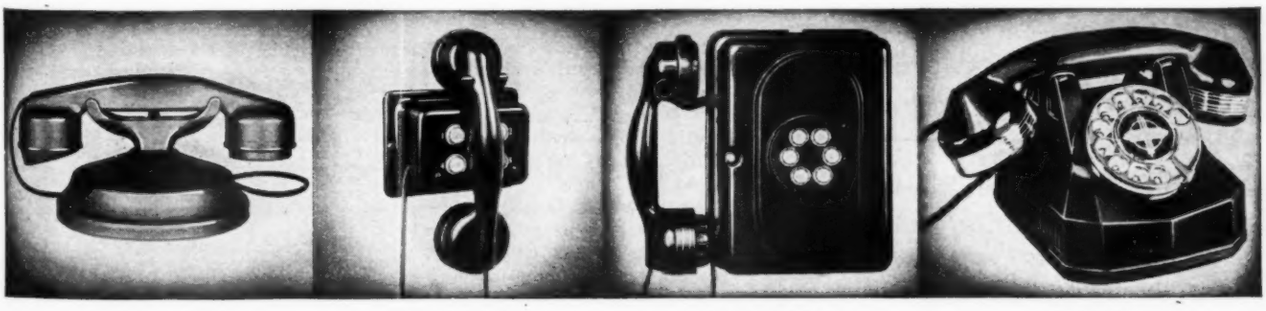
Sell Big Business and The Little Fellow Automatic Electric Private Telephones

New conditions have imposed new demands on business—all down the line. With new production deadlines to be met, many an organization is critically examining its operating methods—its interior communication facilities—in the light of present requirements.

All of these companies are natural prospects for Automatic Electric private telephone systems and *now is the time to sell them.*

Four of the many types of systems available are presented here. Ask your electrical wholesaler for complete information, literature and prices on the full line—today!

Automatic Electric intercommunicating systems are designed for private service. They are not intended to be connected with the public telephone system.



SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged and simple to install.

IDEALFONES

Wall type with molded handsets. Offered with one or five buttons for common talking service up to ten stations.

INTERCOMS

Supplied in both desk and wall styles—with molded plastic handsets. Common talking systems of two to eleven stations.

P-A-X's

Private automatic exchange systems, providing dial service and secret connections, from ten stations up. Telephones in a variety of types.

AUTOMATIC ELECTRIC

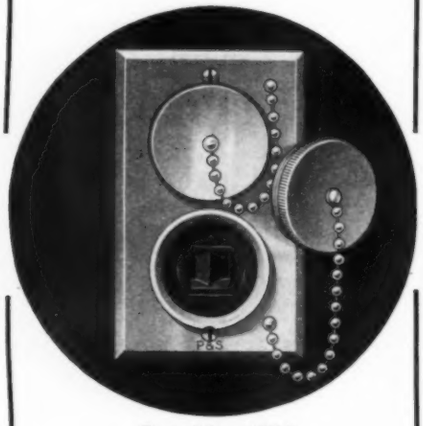
PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies, Limited, Toronto

P&S
WIRING DEVICES

A DUPLEX WEATHERPROOF RECEPTACLE for Single Gang Installation



Cat. No. 4527

Constant tension contacts — .060" plates with baked-on aluminum finish — sealed with cover and plate gasket.

A thoroughly weatherproof installation in one-half the space usually required.

Sold Through Electrical Wholesalers

Catalog on Request

Pass & Seymour, Inc.
SYRACUSE, N. Y.

EQUIPMENT NEWS

[FROM PAGE 96]

Clamps

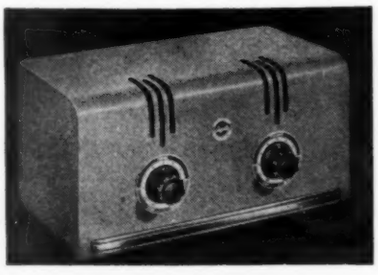
Type HHV bus support clamp claims to simplify the installation of flat bar bus structures. This clamp supports flat bar vertically and same clamp may be used to hold one or more flat bars. If supporting insulator is slightly out of line with other insulators a "slide track" in clamp permits compensation so that flat bar remains straight. Both clamping plates which grip flat bar are securely fastened to base so that any short-circuit stresses are divided over both parts. It is made of aluminum bronze and available for any number of bars of 1½-in. to 12-in. width. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.

BURNDY CLAMPS

■

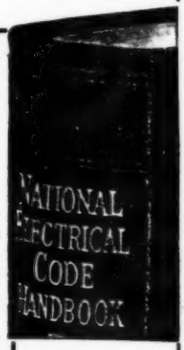
Amplifier

These amplifiers are for low-power restaurant order systems, call systems, etc. It is 6½-in. high, 9-in. wide and 7-in. deep and enclosed in a gray metal cabinet, fully louvred for ventilation. Its output is 6 watts continuous, 8 watts on peaks. One microphone and one phono channel are provided with gain of 105 and 62 db. respectively. Frequency response is 50 to 800 c.p.s. but a tone control is provided. Amplifier is also available as part of a coordinated indoor system or of a portable system in a carrying case. Lafayette Radio Corp., 100 Sixth Ave., New York, N. Y.



LAFAYETTE AMPLIFIER

Just off the press!
THE NEW
NATIONAL ELECTRICAL CODE HANDBOOK
COVERING THE NEW 1940 CODE



By Arthur L. Abbott
FULLY REVISED FIFTH EDITION
585 pages, 5 x 7½, Illustrated, $3.00

HERE is the electrical contractor's job book almost completely re-written in accordance with the new 1940 Code requirements, planned to enable electricians to understand the new rulings of the National Electrical Code and to do work in accordance with the Code.

Simplifies the Code for quick, easy application

It restates rules in simple language, plus explanations, practical directions, and diagrams, showing what the rules mean and how to apply them. *It groups rules in special arrangements, making it easy to find ALL rules applying to any given job.*

IMPORTANT NOTE

The new 1940 Code contains more changes than any previous Code, and the new ABBOTT covers fully every item of this new Code.

Some features of this new edition

- Contains a handy reference table that shows at a glance just what lighting and appliance loads may be connected to each of the five types of branch circuits described in Art. 210.
- Concisely explains complicated new rules in the Code under which 17 difficult types of insulated conductors are recognized.
- Clarifies provisions relating to carrying capacities, rubber-insulated wires, small-diameter wires for re-winding insulations for extra high temperatures, etc.
- Presents the motor wiring and protecting tables, always an important feature of the Handbook, in a new form which makes easy the solution of problems which arise when determining the rating or setting the fuses or circuit breakers protecting motor branch circuits.

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Send me Abbott's National Electrical Code Handbook for 10 days' examination on approval. In 10 days I will send $3.00 plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

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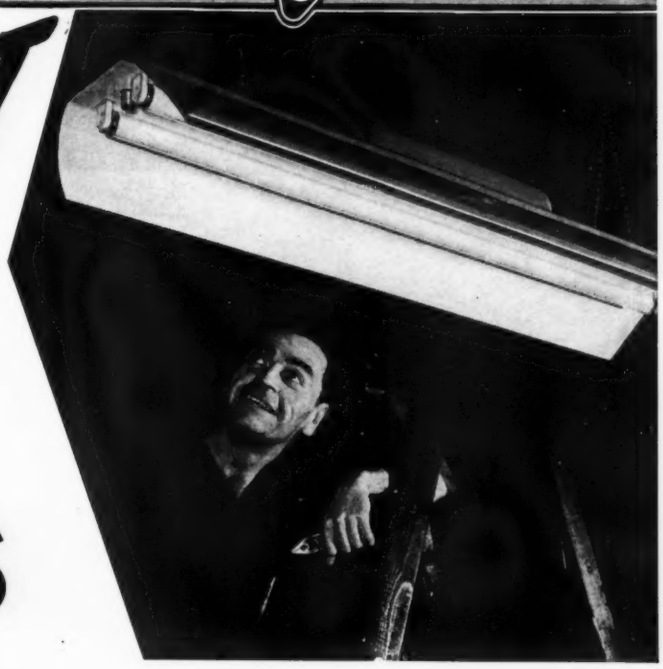
Fluorescent at its Finest by HYGRADE *the pioneers*

SKYROCKET YOUR SALES with MIRALUMES



— the quality-made, completely guaranteed fluorescent lighting fixtures!

YOUR chances of *outselling competition* are tremendously increased . . . when you sell Hygrade MIRALUMES!

You've a tremendous *selling edge* — a combination of features not found in any other fluorescent fixtures!

Add 'em up yourself!

Finer light (Hygrade's patented lamp coating) . . . *sure, trouble-free starting* (Hygrade's patented Mirastat starters) . . . *lower maintenance* (Hygrade's easily demountable reflectors and sturdy lamp holders) . . . plus *a complete guarantee* covering every part!

No costly delays in installing MIRALUMES —fewer returns—greater customer satisfaction. They're better designed and engineered . . . sold wired, ready to install, complete with *superior* Hygrade Lamps . . . approved by Underwriters Laboratory, with high power factor circuit . . . starters easily accessible . . . eligible for FHA financing.

Write today for MIRALUME catalogue, prices, discounts. Dep't EC3, Hygrade Sylvania Corp., Ipswich, Mass.

NEARLY 100 PATENTS PROTECT HYGRADE PRODUCTS!

Extraordinary lighting efficiencies are obtained in Hygrade Fluorescent Lamps by tuning the ultra-violet energy to the 2537 Angstrom Units wavelength effective in causing the porous film (Hygrade Patent No. 2,096,693) to generate light as shown in Hygrade controlled Patent No. 2,126,787. Hygrade products are exclusively protected by nearly a hundred other patents, including No. 2,201,817 and No. 1,982,821.

Hygrade MIRALUMES

Complete with Hygrade Fluorescent Lamps

Hygrade Sylvania Corp., Est. 1901. Makers of Hygrade Fluorescent and Incandescent Lamps and Sylvania Radio Tubes

Copr. 1941 Hygrade Sylvania Corp.

SLOWED DOWN by

TAPE TROUBLES?

Here's how GraybaR *can help you!*

1. FRICTION TAPE

First of all, by providing a source of top quality friction tape that is pre-tested at the factory. These tests are your insurance against ravelling and pinholes as well as assurance of proper aging, adhesion and strength. Thus, when you buy friction tape "via GRAYBAR" you get a full measure of insulation and protection.

2. RUBBER TAPE

Secondly, by a complete stock of the highest grade of rubber tape available. GRAYBAR rubber tapes contain no fabric whatsoever and, therefore, have an extremely high insulating value. Other advantages are their elasticity, resistance to aging and the ability to self-vulcanize into a solid watertight joint.

3. FREE BOOKLET

Thirdly, by offering to you, at no charge, a booklet giving the "down-to-earth" story of tests, grades and quality factors that will help you save money on tape. Write today for your copy of "What to Look For and Why" . . . simply address Graybar Electric Company, Graybar Building, New York, N. Y.

GRAYBAR IN OVER 80 PRINCIPAL CITIES

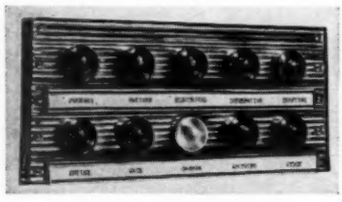
GraybaR QUALITY — *Distributed and guaranteed by* GraybaR ELECTRIC COMPANY

EQUIPMENT NEWS

[FROM PAGE 98]

Mounting Strips

To facilitate the use in multiple of signal-lights, toggle switches and push buttons, a line of standardized mounting strips has been developed. Strips are of stainless steel, with a rippled finish and have beveled ends. It is furnished with all devices mounted on same, ready to install and place in service. Available in three lengths, to contain two, three or five units per strip. Strip may contain any combination of devices, and may be banked together. All devices are for service on voltages up to 220 volts. Each strip is mounted with two screws directly to machines, cabinets, panels, desk-tops. H. R. Kirkland Co., Morristown, N. J.

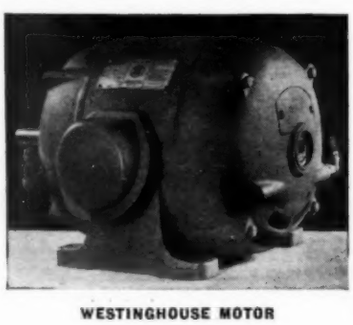


KIRKLAND MOUNTING STRIP

■

Motors

These new open-type sleeve-bearing squirrel-cage induction motors have been designed for general purpose drive applications, such as machine tools, pumps, auxiliary drives. Type CS motors are available in ratings from ½ to 5 hp. at speeds from 875 to 3600 rpm., for operation on 110, 220, 440 and 550 volts, 2 and 3 phase a.c. Frames maintain constant air-gap between stator and rotor. Frame improvements include new sealed sleeve bearings having combination vestibule and felt washer seal and a larger oil reservoir capacity. Oil filler cups may be inserted on either side of motor. New wire insulation gives maximum dielectric strength and flexibility. Combination slot cells, with reinforced cuffs, protect windings from abrasion. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE MOTOR

INDUSTRIAL EXPANSION DEMANDS MULTI "Fluoraine" FIXTURES

UTILITY—provides ideal light of single-lamp intensity for close work—never before achieved in industrial practice.

CONSTRUCTION—one-piece heavy gauge steel reflector covered with three coats of highest quality vitreous enamel. Furnished with knockouts for stem suspension and two loops for chain suspension—½" knockout in one end—switch knockout in other. Can be wired at bench before installing.

WIRING—furnished unwired but all equipment mounted in place. Wired in advance at slight additional cost.

Send for New Bulletin

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

Monarch
Your Best Choice for-

MON-O-LAG RENEWABLE FUSES

● Quality workmanship and materials identify *all* Monarch Fuses. Of simple but sturdy construction, it's easy and quick to renew. Completely approved in all sizes and both voltages.

Monarch renewable fuses comply with Federal Specifications.

Monarch
FUSE COMPANY, INC.
JAMESTOWN, NEW YORK

THIS IS WHAT EDWARDS IS DOING FOR THE ELECTRICAL CONTRACTOR

THIS marks the third year of intense promotion by this Company to make it possible for the Electrical Contractor to do a conscientious job . . . to make a complete and profitable installation of Edwards' signaling devices in a residence instead of throwing in a cheap bell and buzzer as part of the overhead . . . to include an annunciator to tell where a call comes from and artistic pushes wherever it might be necessary to call a servant. Therefore, this promotion is aimed:

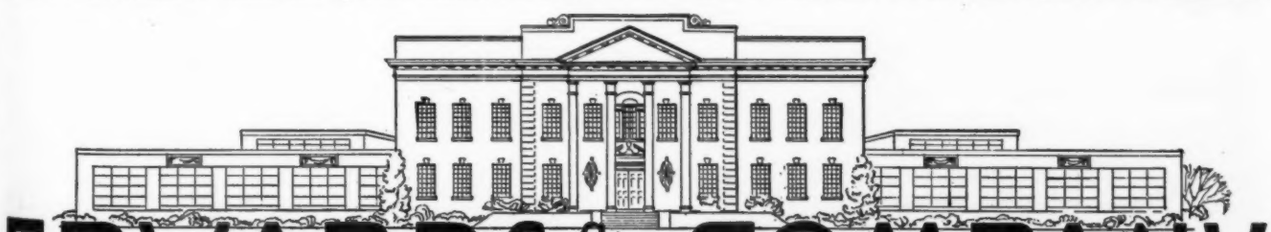
To induce the architect to write detailed specifications so the contractor can conscientiously figure a job by a complete listing in Sweet's and large space units in architectural publications.

To tell Mrs. Homeowner to insist that her architect include detailed specifications by national advertising in such consumer publications as House Beautiful, House and Garden, Better Homes and Gardens, Etc.

To suggest that home owners, builders and architects plan the home for graceful living through Real Estate sections of the newspapers throughout the Country.

To remind Edwards' distributors, contractors, architects and engineers that there are more than forty well informed sales engineers working all day, every day from the twenty-six Edwards' offices with adequate stocks at points throughout the Country.

It doesn't cost Mrs. Homeowner any more to have convenient and artistic signaling if it is Edwards. Consult your nearest Edwards' sales engineer for Adequate Signaling.



EDWARDS and COMPANY

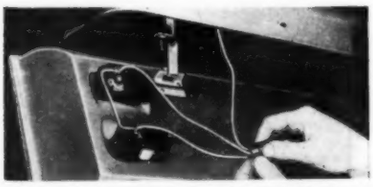
NORWALK · CONNECTICUT

USE! SAVE WITH—

Wire Nuts

EASIER, BETTER

WIRE JOINTS!



Ideal for Fluorescent Wiring

- Solderless, Tapeless Wire Connectors.
- Just strip wires, screw on—that's all!
- No solder, no heat, no open flame hazard.
- Better electrically—stronger mechanically.
- Make craftsmanlike job—no messy joints.
- Sizes for all common wire joints.
- Fully approved: Listed by Underwriters' Laboratories, Inc.
- Safer. Pass inspection quickly.

MILLIONS IN USE!

NEW

IDEAL TEST GLO

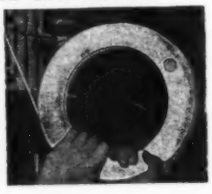
SAFE! — Tests electrical and radio circuits, motors, fuses, etc. from 80 to 550 volts A.C. or D.C.

NEW

IDEAL "HANDY" FISH TAPE, REEL and PULLER

- Prevents breakage — keeps fish tape under control.
- Complete with 50 ft. of ⅛" x .045" tape.

PRICE—Only $1.50



NEW

IDEAL BX ARMOR CUTTER

- Cuts armor from 2 or 3 wire No. 12 or No. 14 BX in one operation.
- No more nicked insulation, shorts or wasted BX.
- Pocket size. Inexpensive.

NEW

"SNAP TITE" SWITCH BOX SUPPORTS

- Holds switch box in composition walls.
- No screws or special tools required.
- Fits all standard boxes.

NEW

IDEAL JOIST BORING MACHINE

- Bores at any angle through joists, rafters, etc.
- No climbing—no stooping—no straining.
- Works up to 11 ft. above or below floor level.

IDEAL SOLD THROUGH JOBBERS

IDEAL COMMUTATOR DRESSER COMPANY

1041 Park Avenue Sycamore, Illinois

"SALES OFFICES IN ALL PRINCIPAL CITIES"

EQUIPMENT News

[FROM PAGE 100]

Transmissions

A new series of "Select-O-Speed" transmissions, equipped with electric motorized control, has been developed. Electric control is recommended where drive must be mounted on ceiling, back of or inside equipment. A two button switch controls speed. Changes in speed adjustments are made by pushing and holding either fast or slow button until desired speed is obtained. Electric control is available on transmissions of sizes from 1½ to 7½ horsepower capacity. Ideal Commutator Dresser Co., 1041 Park Avenue, Sycamore, Ill.

IDEAL TRANSMISSION

■

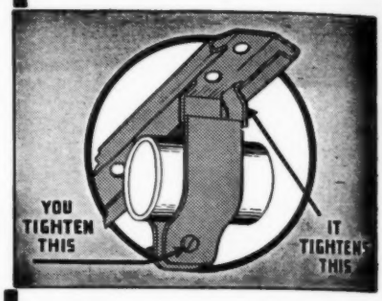
Searchlight

This new 18-inch 1000/1500-watt incandescent searchlight, Type S-5, is adapted for use in protective lighting systems installed by industrial concerns. Some other applications are railroad yards, construction projects, dams, locks, canals and prisons. It is equipped for pilot-house or hand control and comes with either low or high pedestal. It can be mounted atop a guard house or lookout tower and controlled from within house. A silvered glass parabolic reflector provides control of light beam. General Electric Co., Schenectady, N. Y.

G-E SEARCHLIGHT

With Only One Screw to Tighten. . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

●

"CONVINCE YOURSELF"

"Send for Circular Giving Full Details"

●

THE CLEVELAND SWITCHBOARD CO.

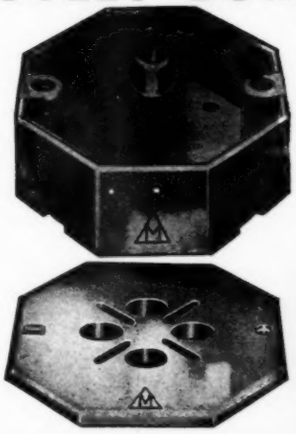
2927 E. 79 St. Cleveland, Ohio

Profit by USING

ILLINOIS

Dependable Porcelain

OUTLET BOXES



★ Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.

MACOMB, ILL.

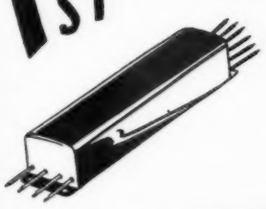
Blazing New Trails . . .

DONGAN ANNOUNCES 3 NEW FIRSTS IN FLUORESCENT CONTROLS

1ST DONGAN "TWINLAMP"

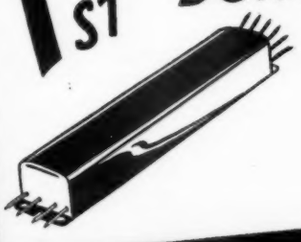
1. Dongan was the first to include starting compensators in standard *"TWINLAMP"* controls. Remember?
2. The first to supply a low cost means with which to obtain *"TWINLAMP"* effect on low power factor installations, through the use of leading "singelite" controls. Remember?

1ST DONGAN "TRILITE"



1. Now Dongan announces *"TRILITE"* controls for 3 fluorescent lamps, with maximum correction for Power Factor and Stroboscopic effect (flicker).
2. Also a new *"TRILITE"* control of lower P. F. correction (approx. 85%) for economy fixtures where maximum correction is not essential.

1ST DONGAN "QUADLAMP"



1. Dongan further announces a new *"QUADLAMP"* control for four lamp fixtures with maximum correction for Power Factor and flicker.
2. There is no tax on Quality. These new items, (created by Dongan) effect important savings. They blaze new trails for Fluorescent Lighting. KEEP YOUR EYE ON DONGAN.

for the

1. Fluorescent Fixture Manufacturer
2. Electrical Wholesaler
3. Electrical Contractor
4. Industrial Plant
5. Commercial and Public Institutions

•

Other Dongan Products

Transformers for . . .

High Intensity Mercury . . . Supplementary Machine Lighting . . . Power-line step-down for lighting. Neon or Luminous Tube lighting.

Signaling . . . Ignition for Oil and Gas burners . . . also transformers for special applications . . . motor control, etc. Ask for bulletins.

Fluorescent Lighting is a MUST in our Defense Program. Not alone will it give ***added*** light for better sight . . . it gives ***better*** light for seeing. It improves production . . . cuts down on accidents because it improves working conditions. It will relieve over-loaded circuits . . . permitting increased POWER LOADS to be served from present electrical capacity.

People in America should realize the importance of POWER FACTOR correction. Those that ***do*** will neither buy nor sell products that fail to meet the highest standards. Without cost or obligation, Dongan will mail you a copy of "'Jonnie' Dongan Tells All on Power Factor." An instructive booklet, devoid of advertising.

Ask Your Wholesaler or Write

DONGAN ELECTRIC MFG. CO.

DETROIT 2985-2995 FRANKLIN STREET MICHIGAN

"The Dongan Line Since 1909"

DEFENSE CALLS FOR SPEED!...

Speed Calls for BLACKHAWK PIPE BENDERS

★ Fast work on building construction, plant change-overs and new machine installations calls for quick power hook-ups. You can definitely speed up work and cut down time losses with these powerful Blackhawk Hydraulic Benders. They are lightweight, compact, portable, can be carried or rolled to the job and operated by one man. Porto-Power Benders work in any position, at any angle, and speedily and smoothly bend rigid conduit and pipe up to 4 inches in diameter.

★ Save need for factory-formed elbows and couplings, and otherwise necessary cutting and threading. Low cost — often pay for themselves on first job.

MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P2031, Milwaukee, Wis.
Send full information on your Pipe Benders — also how same equipment can be used on maintenance work and as special jacks.

Name.....

Address.....

City.....State.....

EQUIPMENT News

[FROM PAGE 102]

Fluorescent Unit

A new and improved model of the Miralume HF-100, industrial fluorescent unit, has been developed. Reflector is shaped in parabolic curve, which throws light downward toward working surface. Working parts are mounted in housing. Dimensions are 41¼-in., width 13⅜-in. and height 7 3/32-in. Lead wires supplied as standard equipment. Units available for 110-125-volts and 220-250-volts, 60 cycle, a.c. Will be supplied in 50 cycle a.c. or unwired on request. Hygrade Sylvania Corporation, Salem, Mass.

HYGRADE FLUORESCENT UNIT

■

Reflector Lamp

A new 200-watt R-40 mazda reflector lamp may be had in either the spot or flood type. Except for wattage, essential technical data are the same as those of the familiar 150-watt and 300-watt G-E mazda reflector lamps. This intermediate size, it is believed, will answer many of the needs for this size and type of lamp, especially in the display field. General Electric Co., Nela Park, Cleveland, Ohio.

■

Motors

A new line of totally enclosed fan cooled motors has been announced. Motors are modern, with smoother, more symmetrical surface. They provide protection where air is foggy with metal cutting solutions or there are abnormal quantities of metallic, abrasive and other dusts. Cooling air is forced through large air passages by non-sparking fan. They are finished in machine gray. Century Electric Co., 1806 Pine Street, St. Louis, Mo.

CENTURY FAN COOLED MOTOR

MIDGET TRIPLOC

A new line of plugs and receptacles, smaller, lighter weight, yet retaining many heavy duty features of the regular Triploc line.

●

PYLETS

.. the improved heavy duty conduit fittings
Standard and Explosion-proof types

PLUGS AND RECEPTACLES
VAPORTIGHT FIXTURES
FLOODLIGHT PROJECTORS
AIRPORT LIGHTING EQUIPMENT

●

Write for bulletins

THE PYLE-NATIONAL COMPANY

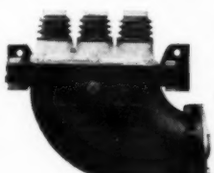
1344 North Kostner Avenue
CHICAGO, ILLINOIS

ELECTRICAL SPECIALTIES FOR HEAVY INDUSTRIAL SERVICE . . .

Endulators (Potheads) All Shapes, All Sizes, All Voltages Cutout Potheads Secanecs—For Sector Type Cables Conduit Bells

RMC

Rusgreen Bus Clamps Bus Supports Splicing Units Split Tinned Connectors Copper Cable Sleeves Insulating Compounds Cable Splicing Kits



One of many types of Endulators for use with steel or fibre conduit. D.C. service, or non-ferrous metal

Rusgreen Bus Supports . . . made for indoor or outdoor service, all types and constructions.

For over a quarter of a century, Rusgreen has been making standard items, and special items, built to your most exacting requirements. Write for our latest bulletins!

RUSGREEN MFG. CO.

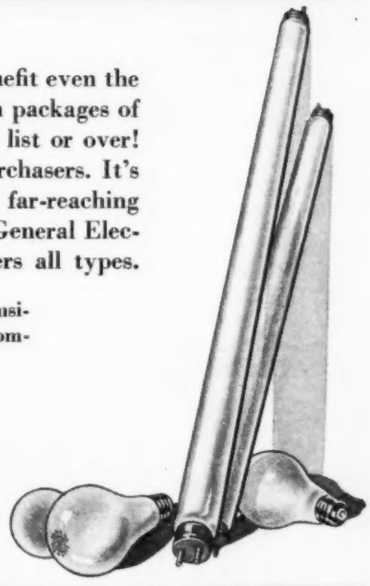
14260 Birwood Ave., Detroit, Mich.

General Electric Announces Lower Prices on Quantity Purchases of G-E MAZDA Lamps!

A RARE OPPORTUNITY FOR YOU! As of March 1st you can sell every small factory, office, store, apartment and restaurant at a quantity price that is the lowest in G-E history! Start *now, today!* Tell every customer and prospect of the savings he can make through quantity purchases of G-E MAZDA lamps.

New quantity discounts that benefit even the small buyer. 20% off on broken packages of $5 list or more! 25% off on $15 list or over! Larger discounts to contract purchasers. It's one of the most significant and far-reaching discount changes ever made on General Electric MAZDA lamps—and it covers all types.

BE SURE TO ASK FOR COMPLETE details of the new G-E discount plan. It affects every business customer on your books as well as your agents who buy lamps for resale! For complete information, see your G-E Distributor.



G-E MAZDA LAMPS
GENERAL ELECTRIC

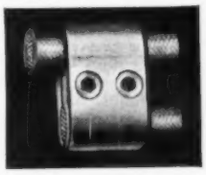
NEW! **65-WATT G-E MAZDA F (FLUORESCENT) LAMP** available April 1st. Of special interest to stores, hotels, restaurants, clubs, offices! Colors: Daylight and White 3500°. Size: 36″ by 2⅛″. List price $2.75.

The MOST COMPLETE
LINE OF
Cable Taps

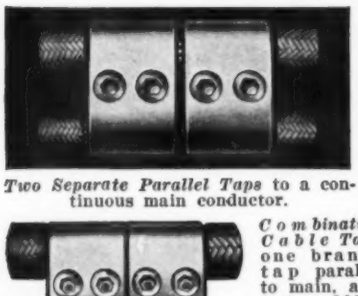
Parallel and 90° taps—and combinations—for the widest variety of applications. For conductor sizes up to 1,000,000 CM.

Now you can select from a really *complete* line of standard and special taps. Carefully designed—made right—and giving excellent service to all classes of users.

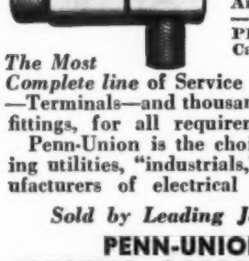
Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union Cable Taps.



2-Way Gutter Tap; main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.



Combination Cable Tap; one branch tap parallel to main, and one at 90°.

And many more—write for the PENN - UNION Catalog.

The Most Complete line **of Service Connectors—Terminals—and thousands of other fittings, for all requirements.**

Penn-Union is the choice of leading utilities, "industrials," and manufacturers of electrical equipment.

Sold by Leading Jobbers

PENN-UNION ELECTRIC CORPORATION
ERIE, PA.

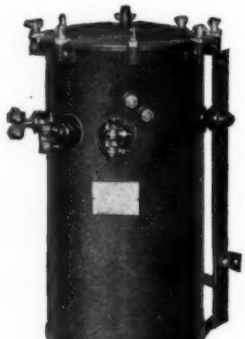
PENN-UNION
Conductor Fittings

EQUIPMENT NEWS

[FROM PAGE 104]

Transformer

The Noflamol transformers are filled with a non-inflammable synthetic liquid, developed as an improvement over regular transformer oil. Because of the non-inflammable characteristics of this liquid, these transformers can be installed indoors without the use of fireproof vaults. The circuit can be divided into several sections and a transformer placed at the load center of each, eliminating long runs of secondary copper, reducing line losses and improving voltage regulation, it is claimed. Can be installed on the floor, in out of the way places or on beams up near the ceiling. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

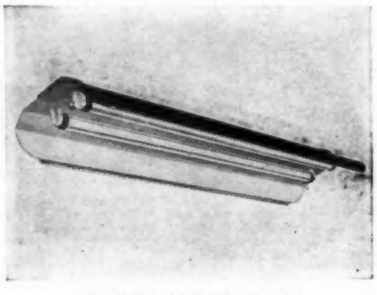


WAGNER NOFLAMOL TRANSFORMER

■

Fluorescent Fixture

A new open-end twin lamp fluorescent luminaire, has been designed for general high level illumination in industrial plants. It uses 100 watt, 60-inch, white or daylight fluorescent lamps. It is available for operation on 110-125, 199-216 and 220-250 volts, 60 cycle a.c. Unit consists of hood, reflector, lamp holders, starting device and ballast equipment. Two reflector types provide a choice between totally direct and diffused, or semi-direct illumination. All auxiliary equipment mounted and wired as part of assembly and provides easy access for line connections during installation. Westinghouse Electric & Manufacturing Co., Cleveland, Ohio.

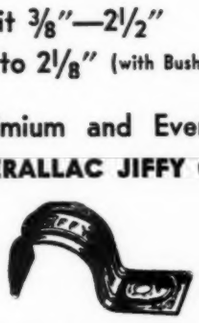


WESTINGHOUSE FIXTURE

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP



Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

BADGER
Synchronous
ELECTRIC TIME SWITCHES

CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install

USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN

Plugs and Receptacles

A new line of heavy duty plugs, receptacles and cord connectors for use with portable electrical equipment has been developed. Known as the Midget Triploc plug and receptacle it comes in 2, 3, and 4 pole types. Rated 10 amperes, 250 volts; 15 amperes, 125 volts. All contact units are interchangeable to permit using a wide variety of plug shells and receptacle housings. Contact units are reversible. Units have renewable self-aligning flat bronze contacts and side-wired binding screw terminals. Seven types of receptacle housings are available, in addition to cord connector type receptacle housing. The Pyle-National Company, 1334 N. Kostner Ave., Chicago, Ill.

PYLE-NATIONAL PLUGS AND RECEPTACLES

■

Fluorescent Lamps

Three new mazda fluorescent lamps have been added to this line. Daylight color in the 100-watt lamp is now available in addition to the present 100-watt mazda F lamp in the 3500° white. The 14-watt mazda F lamp, primarily used for train lighting, can also be obtained in the daylight color. It can be used to some extent in general and decorative lighting where the shorter bulb length is desired and in portable floor lamps. The new soft white color is now available in the 15-watt 18-inch lamp. Westinghouse Lamp Division, Bloomfield, N. J.

■

Ignitron Tubes

This line of ignitron tubes for resistance welder control has been redesigned. New tubes have both inner and outer jackets of steel and are corrosion resistant. Tubes carry very high peak currents for short periods. These tubes are available in ratings suitable for controlling nearly all sizes of resistance welding machines. General Electric Company, Schenectady, N. Y.

G-E TUBES

HOW ON EARTH DID THEY DO IT?

TRUMBULL

Speed of Aircraft Faster Than Radio

Radio has to move fast to keep up with the aircraft industry. United Aircraft Corporation, invited to participate in a nation-wide broadcast to describe the industry's part in national defense, Saturday afternoon agreed, as part of the program, to have a broadcast from its gear-grinding department. Microphones were set up in the department Friday afternoon.

Saturday morning radio engineers went 'round again for a check-up. They found the 150 or more gear-grinding machines had been moved during the night to another part of the 37½-acres plant, leaving the microphones standing as lone sentinals. The grinders averaged about one half ton weight. They were moved to new locations at a speed that averaged one every 53 seconds. Altogether it was about a 2-hours job.

The microphones had to move quickly to catch up.

REPRODUCED FROM THE HARTFORD COURANT

with **FLEX-A-POWER** *of course*

They had FLEX-A-POWER installations in both old and new buildings. All they had to do was "pull" out the individual FLEX-A-PLUGS connecting to the machines, move the machinery to new locations and "plug" them in on the new FLEX-A-POWER lines. That's the outstanding feature of this modern bus bar system for making direct electrical connections to machines.

And it's a mighty important feature to have in YOUR plant these days . . . especially when you consider that a Trumbull FLEX-A-POWER installation frequently costs LESS than old power wiring methods and is COMPLETELY SALVABLE.

Write at once for FLEX-A-POWER TRUMBULLAID Bulletin No. 408

ESTABLISHED 1899

THE TRUMBULL ELEC. MFG. CO.

PLAINVILLE CONN. U.S.A.

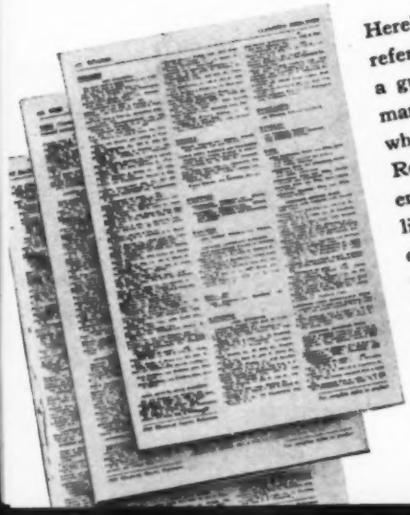
A GENERAL ELECTRIC ORGANIZATION

KEEP *Alert* ELECTRICALLY use your TRUMBULLAIDS

NEW YORK - PHILADELPHIA - BOSTON - CHICAGO - DETROIT - LUDLOW, KY. - ATLANTA - NASHVILLE - LOS ANGELES - SAN FRANCISCO - SEATTLE

A wealth of product data at your fingertips!

Take **WIRE** *for example*



Here's a sample of the cross-referenced indexes which are a guide-and-compass to the manufacturers' catalogs . . . which make Electrical Buyers Reference the *complete* reference volume. 12 columns of listings on wire alone, broken down by types. (Bold face type refers you to manufacturers' catalogs.) This listing is supplemented by a trade and company name index.

That's why we say "Electrical Buyers Reference is your *FIRST* source of information."

● There are *over 100* pages of manufacturers' catalogs on wire alone! Solid *buying* and *specifying* information of leading companies . . . from stranding tables to addresses of local sales representatives and distributors!

Electrical Buyers Reference compacts this information into one handy, valuable volume.

We've taken wire only as an example. Actually, Electrical Buyers Reference contains manufacturers' catalogs on scores of different items . . . *the information you need on the products of 238 individual manufacturers of electrical and allied products.*

AND, IN ADDITION, completely indexed listings of products, manufacturers, trade names, etc., for over 3500 companies!

Make Electrical Buyers Reference your **FIRST** Source of information!

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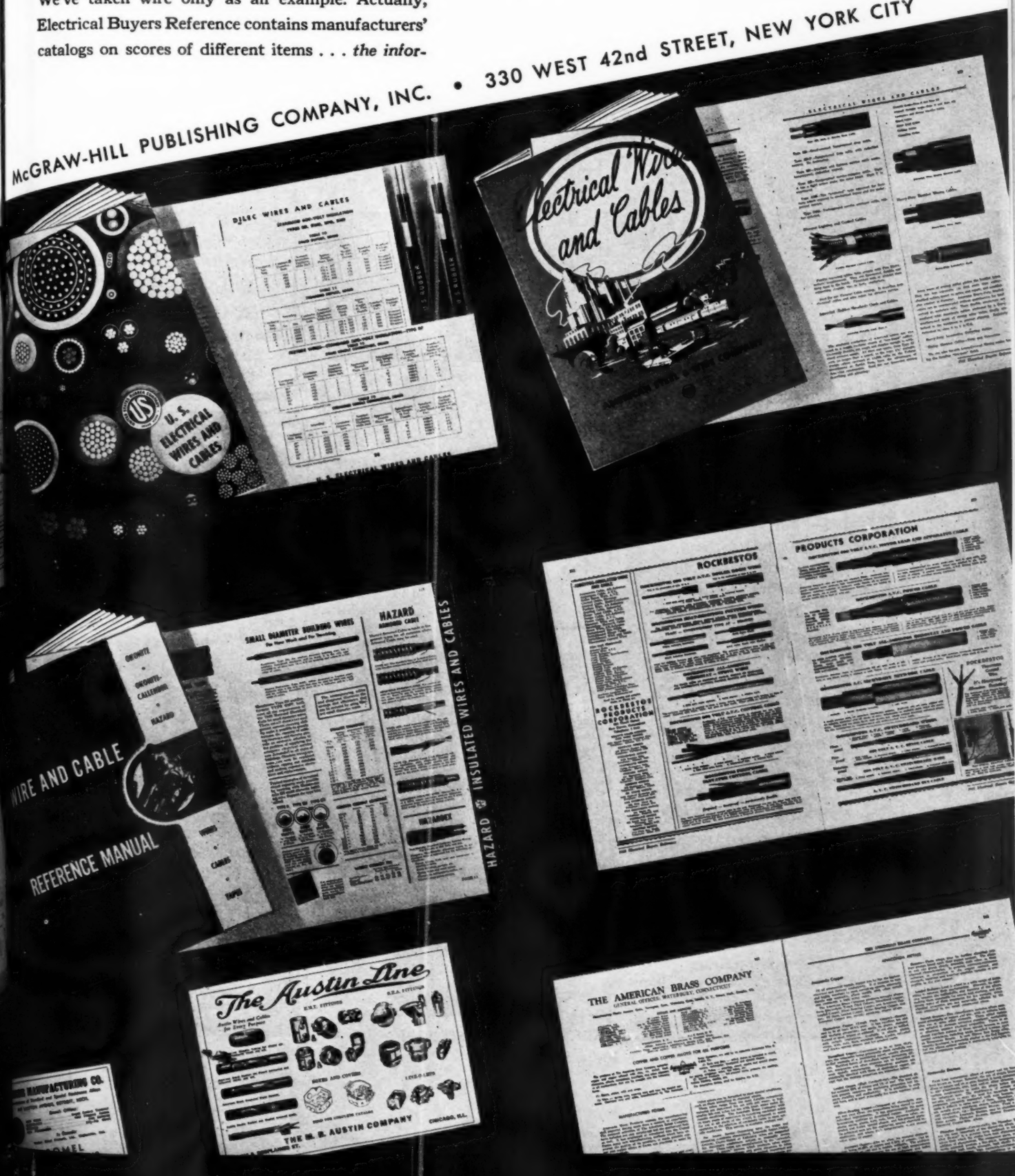


NEW

The
"AUTOPHONE"
SYSTEM
of
AUTOMATIC
TELEPHONES

Designed for Industrial Plants, Offices, Institutions and other Buildings where speedy and efficient communication is required.

- 30 and 50 line switchboards
- Completely Automatic
- Quick Dialing
- Secrecy
- Code Call & Conference Service
- Low Cost Installation
- No Batteries.

Write for Bulletin 108E

S. H. COUCH COMPANY, INC.
NORTH QUINCY, MASS.
Sales Offices in Principal Cities
Established 1894

Manufacturers of
Private Telephones, Fire Alarms Bells, Code Call, Apartment Mail Boxes, Blake Staples

EQUIPMENT News

[FROM PAGE 107]

Conduit Fittings

A new group of fittings for aluminum conduit and electrical connector applications in accordance with U. S. Army and Navy standards has been announced. This line of aluminum alloy fittings, comprising 12 classes and 130 pieces, is available for Army-Navy standard rigid or flexible aluminum conduit from ⅜-in. to 2½-in. Designed particularly for aircraft use, these fittings are also used in industrial, railroad, marine, radio and specialized applications. The formed aluminum ferrules are fastened to flexible aluminum conduit by a roller crimping method. American Phenolic Corporation, 1250 Van Buren St., Chicago, Ill.

AMERICAN PHENOLIC FITTINGS

■

Meter

This new vibration frequency meter is designed to aid the engineer in ferreting out causes and cures of troublesome machine vibrations. It is no larger than an engineer's slide rule and weighs eight ounces. It can indicate what frequencies between 500 and 20,000 cycles per minute are present in a vibrating body. To use meter, its head is held against vibrating body and adjusting knob rotated until vibrator reed moves to and fro at maximum amplitude. If more than one vibrating frequency exists, there will be a point of maximum amplitude for each. It can measure harmonies of basic vibration frequencies. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

WESTINGHOUSE FREQUENCY METER

There Is
A Profit For YOU
In Automatically
Turning ON and OFF
ELECTRIC SIGNS—
LIGHTING SYSTEMS
And Dozens of Other Applications
with the
2200-Watt AUTOMATIC
Self-Starting TIME SWITCH
Single Pole—MODEL 120
$12.00
Why buy LESS
when you get the MOST
in AUTOMATICS?
Prices Subject to Usual Discount & Terms
Write for Information
on Complete New Line
AUTOMATIC
Electric Manufacturing Co.
TIME SWITCHES — FLASHERS
MANKATO • MINNESOTA

K&H Solderless Terminal LUGS
A SIZE and TYPE for every need!

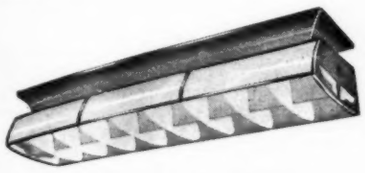
T CONNECTORS
Both Ends Adjustable

Catalog Nos. T4 to T201
To fit over moderate range of conductor sizes. For tap and main of like size or different sizes.
DELIVERY FROM STOCK
Write for Catalog 3LC

KRUEGER and HUDEPOHL
232-8 Vine St.
CINCINNATI, OHIO
K&H Solderless CONNECTORS

Fluorescent Unit

This ceiling unit type fluorescent lighting fixture is known as the General. Some of the features claimed are semi-direct distribution of light; high efficiency; high utilization of light; adequate shielding; ceiling and suspension mounted; easy lamp replacement; low maintenance cost; ceiling type to fit acoustical ceiling blocks. The F. W. Wakefield Brass Co., Vermilion, Ohio.



WAKEFIELD GENERAL UNIT

■

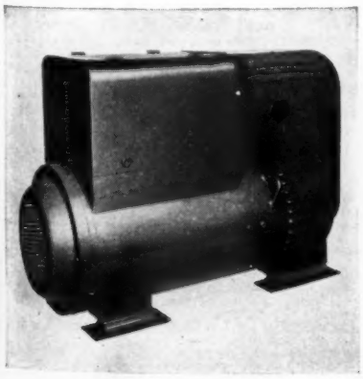
Reflector Lamp

To supply show window and other lighting display needs, new 200-watt reflector spot and flood lamps have been developed. The new R-40 mazda reflector lamp is the same as 150-watt and 300-watt lamps except for wattage. Furnished with medium screw base, maximum overall length is 6½-inches and lamp may be burned in any position. Rated average laboratory life is 1000 hours. Westinghouse Lamp Division, Bloomfield, N. J.

■

Speed Drive

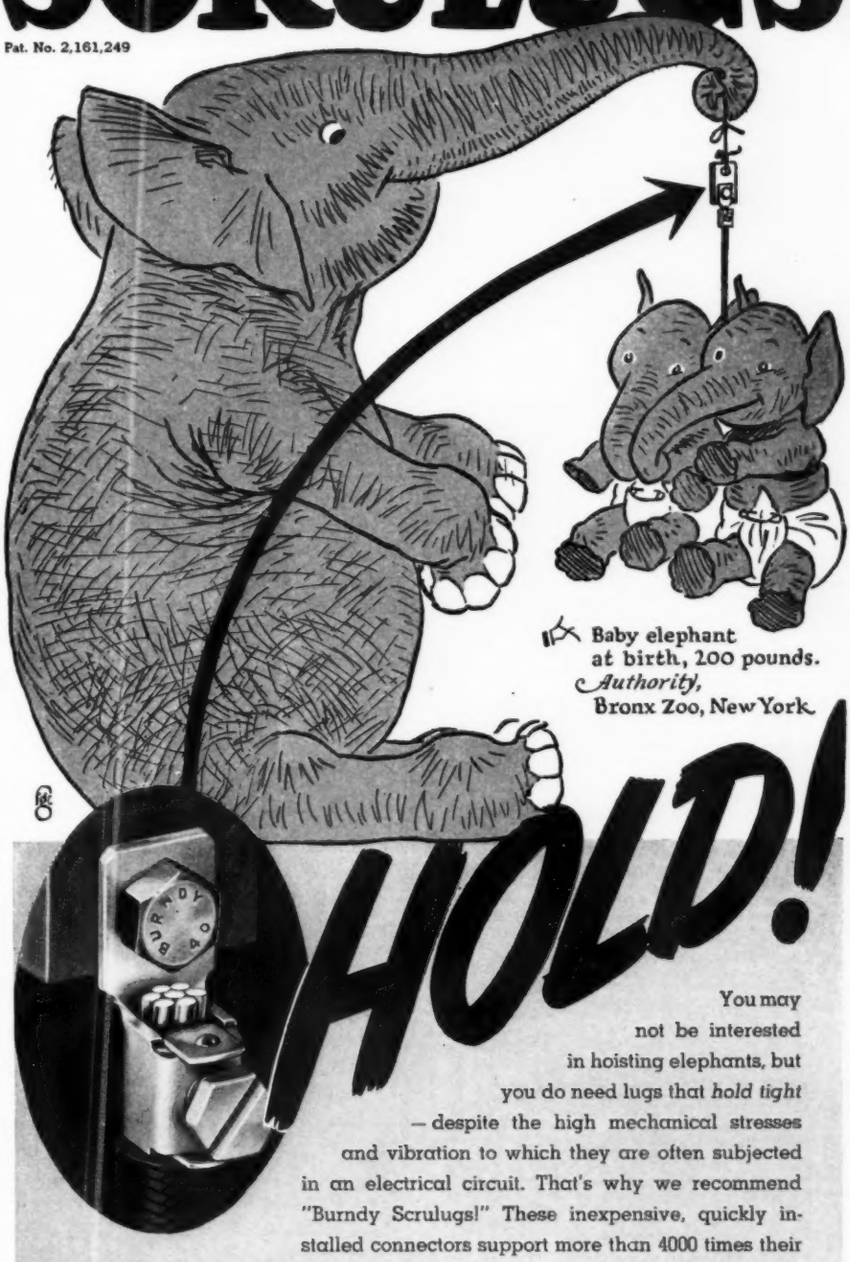
Three V-S units of 20, 25 and 30 hp. have been added to this line of all-electric a.c. adjustable-speed drives. Larger units are mounted horizontally instead of vertically. Three wires from the 3-phase, 60-cycle, a.c. power source, which may be 220, 440 or 550 volts, are connected to the control unit. From the control unit, secondary circuits are run to the other three elements of the "drive," namely, driving motor, speed adjuster and start-stop push button station. Speed adjuster and buttons for starting and stopping driving motor, can be located anywhere on machine the operator may find convenient. The Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio.



RELIANCE V-S UNITS

SCRULUGS

Pat. No. 2,161,249



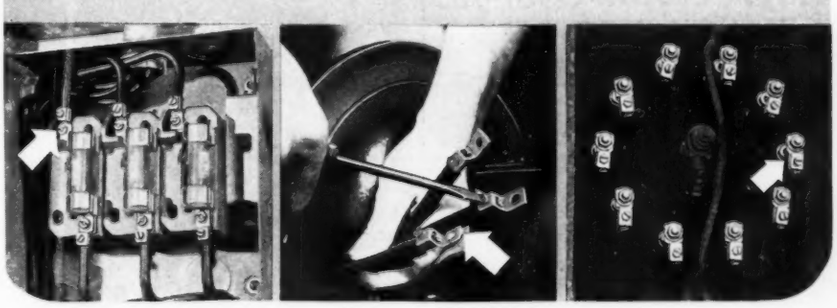
Baby elephant at birth, 200 pounds. *Authority,* Bronx Zoo, New York

HOLD!

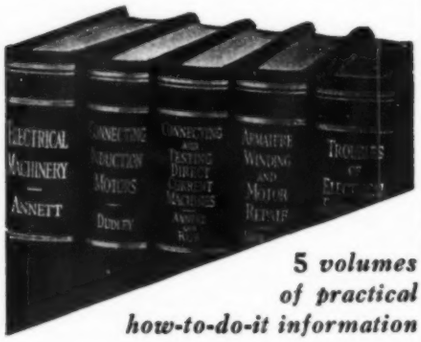
You may not be interested in hoisting elephants, but you do need lugs that *hold tight* — despite the high mechanical stresses and vibration to which they are often subjected in an electrical circuit. That's why we recommend "Burndy Scrulugs!" These inexpensive, quickly installed connectors support more than 4000 times their own weight in cable, laboratory tests show.* Moreover, the patented Burndy design is strictly "Vibration Proof." Your circuit get real protection against loose connections — with Burndy Scrulugs.

**KPA25 Scrulug, for 1/0 Stranded Cable, weighs 1¼ ounces, holds 400 pounds of cable.*

BURNDY ENGINEERING CO. INC. • 459 E. 133 STREET • NEW YORK CITY



Every phase of electrical maintenance and repair work covered in this NEW Library



5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....

Address .....

City and State .....

Firm or Employer .....

Position .....E.C. 3-41

(Books sent on approval in U. S. and Canada only.)

We Will Not Take The Blame!

[FROM PAGE 19]

tomer would think he was only trying to get the business for himself. Just so, the individual manufacturer can't get far by crying—"Don't buy from anybody but me!" But there is somebody else in every city who can act.

The power companies are public servants and the natural guardians of the public interest where something electrical is concerned. They can speak out in this matter. Better yet they can lead in concerted action by the entire local electrical industry. Over the names of the contractors or the electrical league, as well as their own, they can give warning to the public.

It is as simple as that, I think. The electrical men of every community should warn the public frankly that fluorescent units should be bought as lighting. They should explain the fact that irresponsible people are exploiting the popularity of fluorescent light. They should point out that lighting systems should not be changed without sound engineering and safe installation, that intelligent advice should be sought first from responsible local electrical contractors or illuminating engineers. And the fact that such a change in lighting calls for an inspection to safeguard insurance should not be overlooked. How should such action start?

How to Start

Well, important and desirable as it is, I don't believe it will start unless the movement is organized by the fluorescent manufacturers themselves. These manufacturers know lighting and want to protect the public as well as preserve their markets. They are the parties chiefly interested and concerned. They should act first.

They should meet and set up a simple plan. They should then lay their plan before the power companies, and get them to call in the contractors. They should have suggested advertisements ready for use in local newspapers and other ideas to help the local people to see what to do and to do it easily and quickly. They should sell this idea everywhere—strongly, consistently, aggressively.

If this is done, buyers will soon see the sense of it. And it won't be long before they will be calling in responsible electrical contractors and lighting experts, when some shiny salesman convinces them they would like to try fluorescent lighting. And the present confusion will soon be cleared away.

SEARCHLIGHT SECTION

(Classified Advertising)

Employment : : Equipment
Business : : (Used or Resale)

"OPPORTUNITIES"

UNDISPLAYED RATE

15 CENTS A WORD. MINIMUM CHARGE $3.00
Positions Wanted **(full or part time salaried employment only), ½ the above rates payable in advance.**
Box Numbers**—Care of publication New York, Chicago or San Francisco offices count as 10 words.**
Discount of **10% if full payment is made in advance for 4 consecutive insertions.**

DISPLAYED RATE

Individual Spaces **with border rules for prominent display of advertisements.**
The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch **is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.**

POSITION WANTED

ELECTRICAL ENGINEER: Technical school graduate, 7 years practical experience as electrician. 14 years in electrical contractors organizations as estimator and layout engineer. Age 37; married, and American citizen. Location of Philadelphia, Pennsylvania. PW-19, Electrical Contracting, 330 W. 42nd St., New York, N. Y.

USED EQUIPMENT

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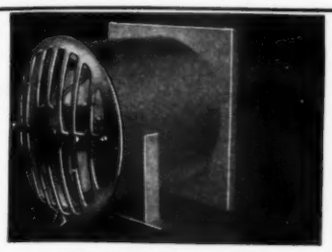

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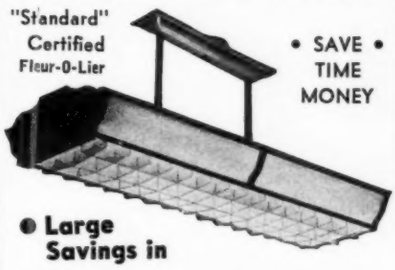
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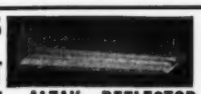
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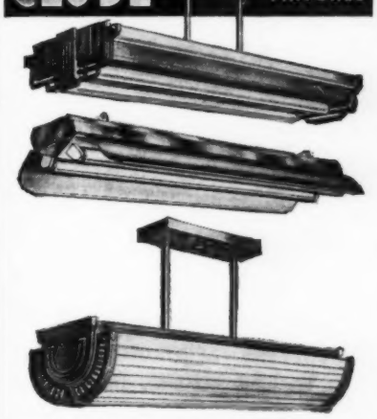
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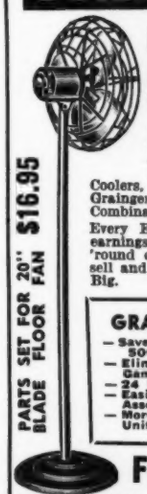
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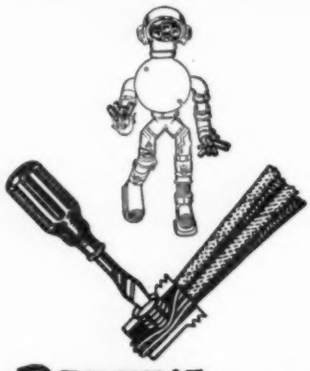

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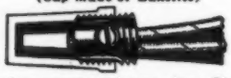

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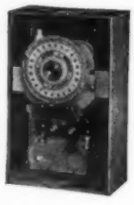

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Advertiser's Index

Acme Elec. Mfg. Co. 88
*Adam Elec. Co., Frank 83
Allen Co., Inc., L. B. 113
*Allen-Bradley Co. 65, 66
American Automatic Elec. Sales Co. 97
*American Transformer Co. 74
Anaconda Wire & Cable Co. 12
*Appleton Electric Co. 77
Arrow-Hart & Hegeman Elec. Co. ... 71
Automatic Elec. Mfg. Co. 110

Beaver Pipe Tools, Inc. 54
*Benjamin Elec. Mfg. Co. 39
Blackhawk Mfg. Co. 104
Brach Mfg. Corp., L. S. 114
Bryant Elec. Co. 8
Bull Dog Elec. Prod. Co. 10
Bunting Brass & Bronze Co. 54
*Burndy Engineering Co. 111

*Carboloy Co., Inc. 60
Century Electric Co. 55
*Chase-Shawmut Co. 95
*Chicago Transformer Corp. 81
Circulators & Devices Mfg. Corp. . 113
Clark Controller Co. 53
Classified Advertising 112
Cleveland Switchboard Co. 102
Couch Co., Inc., S. H. 110
Crescent Ins. Wire & Cable Co. 87
*Curtis Lighting, Inc. 75
*Cutler-Hammer, Inc. 25

*Day Brite Lighting, Inc. 37
Dolph Co., John C. 64
*Dongan Elec. Mfg. Co. 103

Edwards & Co. 101
*Efcolite Corp. 96
Erie Electric Co., Inc. 112

Faries Mfg. Co. 68
*Fast & Co., John E. 63
*Fibre Conduit Co. 31
Fleur-O-Lier Mfrs. 4, 5
*Fullman Mfg. Co 43

General Cable Corp. 45
*General Electric Co. (Bridgeport) Back Cover, 69, 72, 82, 92
*General Electric Co. (Nela Park) . 105
*General Electric Co. (Schenectady) Inside Front Cover, 26, 27, 89
Globe Lighting Fixture Mfg. Co. . 113
Goodrich Electric Co. 32
Grainger, Inc., W. W. 113
*Graybar Electric Co. 14, 100
*Greenlee Tool Co. 84
Guth Co., Edw. F. 6

*Hazard Ins. Wire Works Div. ..35, 85
*Hygrade-Sylvania Corp. 99

*Ideal Comm. Dresser Co. 102
Ilg Electric Vent Co. 46
*Illinois Electric Porcelain Co. 102
*Ilsco Copper Tube & Products, Inc. 96
Insulation & Wires, Inc. 60

Jefferson Electric Co. 7
*Johnson Bronze Co. 60

Kirkland Co., H. R. 113
*Klein & Sons, Math. 40
Knox Porcelain Corp. 48
*Krueger & Hudepohl, Inc. 110
*Kwikon Company 90

Littelfuse, Inc. 113

Mallory & Co., Inc., P. R. 61
*McGill Mfg. Co. 38
McGraw-Hill Book Co. 98, 112
McLaughlin Vent Co. 114
Metropolitan Device Corp. 1
Miller Co. 73
Minerallac Elec. Co. 106
*Monarch Fuse Co. 100
Motor Repair & Mfg. Co. 112
Multi Elec. Mfg. Co. 100

Nelson-Tombacher Co. 113

*Okonite Co. 35, 85
*Onan & Sons, D. W. 96
*Overbagh & Ayres Mfg. Co. 88

Paine Co., The 62
Paragon Elec. Co. 91
Pass & Seymour, Inc. 98
Peerless Elec. Co. 62
*Penn-Union Elec. Corp. 106
Pittsburgh Reflector Co. 33
Porcelain Group 48
Porcelain Products, Inc. 48
Pyle National Co. 104

*Rattan Mfg. Co. 114
*Reliance Automatic Lighting Co. . 106
*Republic Steel Corp. 56, 57
*Ridge Tool Co. 58
Rusgreen Mfg. Co., The 104

*Sangamo Electric Co. 9
Sheldon Electric Co. 86
Sherman Mfg. Co., H. B. 34
Signal Electric Mfg. Co. 88
Simplex Wire & Cable Co. 63
Smallcomb Electric Co. 112
Square D Co. ..... Inside Back Cover
Steel & Tubes Division 56, 57
*Superior Carbon Prod., Inc. 64
Superior Instruments Co. 84
Superior Porcelain Co. 113

*Thermador Elec'l. Mfg. Co. 90
*Thomas & Betts Co., The 80
*Tork Clock Co. 114
Trico Fuse Mfg. Co. 64
*Trumbull Elec. Mfg. Co. 107

*United States Rubber Co. 79
Universal Blower Co 113

Wakefield Brass Co. 93
*Ward Leonard Elec. Co. 86
*Westinghouse Elec. & Mfg. Co. 2, 3, 41
*Wheeler Reflector Co. 44
Wiley, Inc., R. W. 113
Wodack Elec. Tool Corp. 114
*Wolverine Tube Co. 90

Youngstown Sheet & Tube Co. 47

*See 1941 Electrical Buyers' Reference for additional information on these companies and their products.

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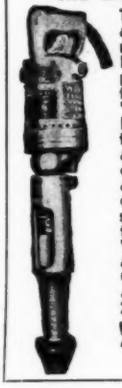

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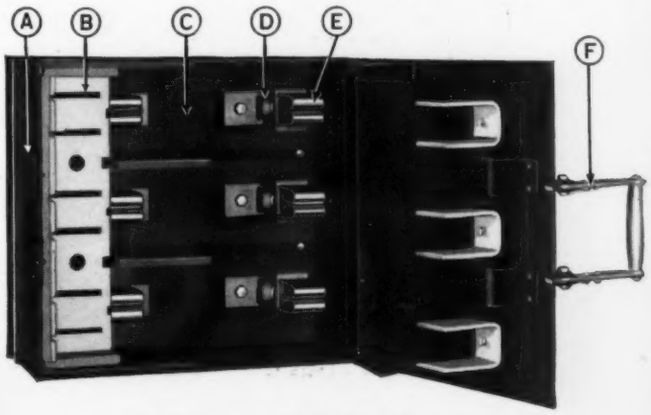

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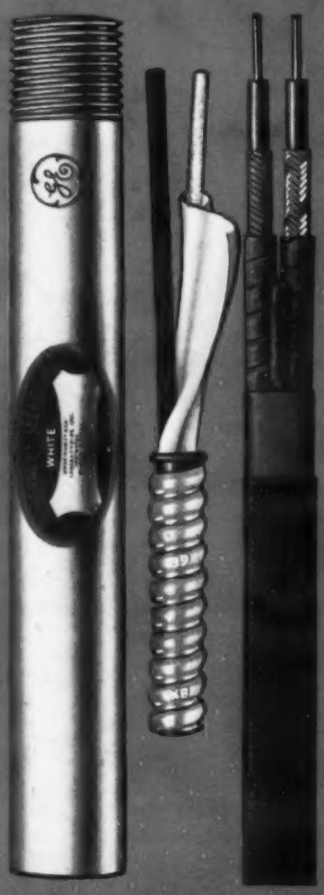

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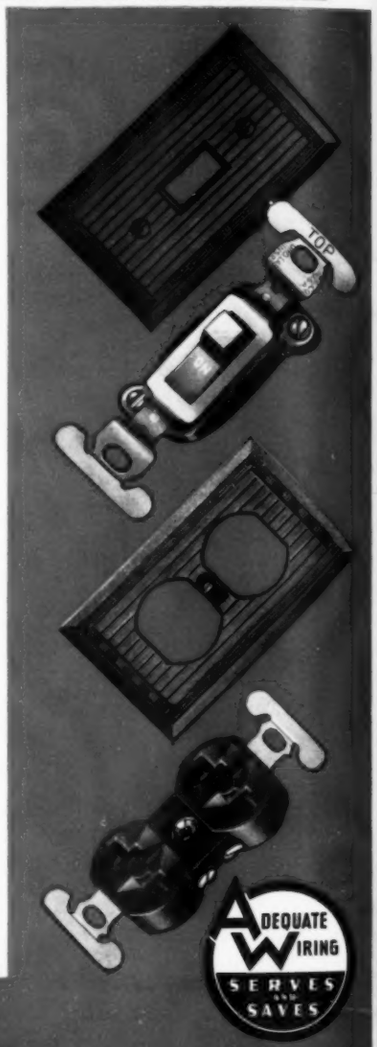

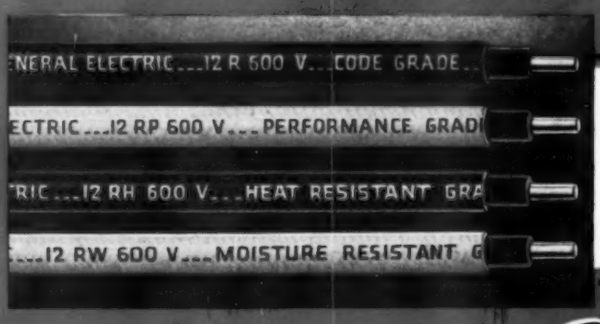
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